

SPICES VARIETIES

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A compendium of morphological and agronomic characters
of improved varieties of spices in India

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भाकृ अनुप
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Cover: Common spices from India

Black Pepper, Cardamom, Ginger, Turmeric,
Nutmeg, Clove, Cinnamon, Coriander, Cumin,
Fennel, Fenugreek.

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A compendium of morphological & agronomic characters
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FOREWORD

India is well known to the Western world as the "Land of Spices". The Portuguese traveller, Vasco da Gama landed in the Malabar coast on May 20, 1498 in search of a viable spice trade with the Zamorins of Calicut. Indian spices are recognised for their quality, pungency and flavour and are the most preferred items in both Continental and Indian cuisine. India contribute to about 20% of world production of spices and account for nearly 30% of its trade. However, the average national productivity of spices in India has not been very encouraging and there is an imminent need to enhance the productivity.

An important component in increasing the yield of spices has been the use of high yielding varieties and improved cultivars. Various spices research centres belonging to State Agricultural Universities, All India Co-ordinated Research Project on Spices, National Research Centre for Spices, Spices Board etc. have in the past, released several varieties of black pepper, small cardamom, ginger, turmeric, cumin, coriander, fennel and fenugreek. Appropriate use of these varieties coupled with the relevant package on agro-techniques, plant protection and post harvest technology would result in higher production and export.

I place on record, my deep appreciation to the scientists from various organizations, who have been responsible in the development and promotion of the 50 odd varieties of different spices. Dr. S. Edison, Project Co-ordinator, All India Co-ordinated Research Project on Spices, Dr. A.K. Johny, Technical Information Officer, Mr. K. Nirmal Babu, Scientist and Dr. A. Ramadasan, Director, National Research Centre for Spices deserve to be congratulated for their painstaking effort in bringing out this useful publication. I have every hope that this bulletin would be a useful guide for both research and development workers on spices in different spice growing states of India.


(K.L. CHADHA)

November 1, 1991.

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Central Plantation Crops Research Institute, Kasaragod.

Gujarat Agricultural University, Jagudan.

Indian Cardamom Research Institute (Spices Board), Myladumpara.

Kerala Agricultural University, Panniyur and Pampadumpara.

Maharashtra Agricultural University, Kasba Digraj.

National Research Centre for Spices, Calicut and Appangala.

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PREFACE

Spices and condiments have played a significant role in the history of civilization, particularly that of India. The value of spices in ancient times was so great that they were equated to the precious stones and gold. It was in 1498 A.D. that the celebrated explorer Vasco Da Gama landed in the west coast of India in search of spices and which eventually resulted in the colonisation of Portuguese in this country.

India, the 'land of spices', has been the major producer and exporter of various spices from time immemorial. Later, seed spices like coriander, cumin, fennel and fenugreek were introduced. India produces about 18 lakh tonnes of various spices, grown from 20 lakh hectares of land.

The production of spices in India was almost static for the last three decades and an important constraint has been the lack of adequate quantities of planting material of high yielding and improved varieties. The Indian Council of Agricultural Research took a major step to improve the spices production by initiating the AICRP on Spices in 1971 and the Regional station of the Central Plantation Crops Research Institute in 1975. Both the project and the regional station along with other institutions engaged in spices research have done yeomen service to identify, develop, promote and release several varieties during the past two decades. Over 50 varieties of various spices like black pepper, small cardamom, ginger, turmeric, coriander, cumin, fennel and fenugreek have been developed. Even though chillies are considered as a spice (especially when it is dried), it is not covered under this publication as they are generally grouped under vegetables.

In this book, the available information on most of the important morphological and agronomic characters as well as salient quality attributes are compiled and presented. By nature of the perennial crops, certain varieties might not have expressed consistency in their behaviour and we have still attempted to bring uniformity in presenting their characters. It is hoped that this book will certainly help many a researcher, development worker, farmer and trader in utilising the available information on spices most meaningfully for their future enquiries and endeavours. We sincerely thank all the research workers who have willingly spared the necessary information from their facility to bring out this useful publication.

*Calicut,
November 1, 1991.*

- Authors

INTRODUCTION

India has the pre-eminent position in production of spices in the world and account for about 30% of the global trade. About 60 spices are grown in India in 20 lakh hectares of land, producing 18 lakh tonnes of various spices like black pepper, cardamom, ginger, turmeric, large cardamom, cumin, coriander, fennel, fenugreek, chillies, garlic, saffron etc. The value of the spices produced is approximately Rs.4,500 crores of which the export is approximately Rs.300 crores per annum through one lakh tonnes. The important states growing spices are Kerala, Tamil Nadu, Rajasthan, Gujarat, Maharashtra, Madhya Pradesh, Orissa, Bihar, Haryana, Punjab, Uttar Pradesh, Andhra Pradesh and Karnataka.

The average productivity of the spices in India is very low (for eg. 257kg/ha for black pepper, 60kg/ha for small cardamom) and there are several reasons for the same. The important bottleneck has been either the lack of an ideal high yielding varieties or the availability of adequate quantities of elite planting materials. As in the case of many field crops the 'VARIETY' holds the key to enhance productivity in spices also. The multiplier between the highest recorded yield versus the national average has been worked out as 6 times in black pepper, 15 times in small cardamom, 5 times in ginger, 5 times in turmeric, 5 times in cumin and 2 times in coriander.

The Government of India as well as the State Governments have been implementing several schemes for spices development. Measures like replanting, rejuvenation, progeny gardens, input kits etc. encompass an important ingredient viz., the best available variety of the particular spice.

The intensive research activity on spices especially since 1971 has resulted in release of a large number of varieties, both at state as well as at national levels. The periodical workshops of the AICRP on Spices have been the most important forum for discussions and recommendation for release of varieties either through the Central Sub-Committee for Crop Standards, Notification and Variety Release or the State Committees for Variety Release. The 15 odd co-ordinating centres under the AICRP on Spices, the National Research Centre for Spices, the Indian Cardamom Research Institute and the various state Agricultural Universities have done yeomen service in developing, promoting and releasing of over 50 varieties in spices till date.

The salient features of the improved varieties of black pepper, cardamom, ginger, turmeric, coriander, cumin, fennel and fenugreek are given in the following pages.

BLACK PEPPER

Black pepper from perennial vine *Piper nigrum* L. (Family: Piperaceae) is the world's most important spice. Considered 'The King of Spices', black pepper is the whole dried fruit while white pepper is the dried seed after removing the fruit wall. Black pepper is native to India and the tropical evergreen forests of the Malabar coast of Southern India is considered the centre of origin.

Black pepper is cultivated in over 1,58,000 hectares of area in the States of Kerala (96%), Karnataka, Tamil Nadu, certain pockets of Maharashtra, Goa, Andhra Pradesh, Orissa, West Bengal, North Eastern States and Andaman & Nicobar islands. Over 100 cultivars of black pepper are prevalent in India among which Karimunda, Kalluvally, Balankotta and Malligesara are most popular besides the hybrid Panniyur-1.

Under cultivation the black pepper vines are trailed on living or non-living standards. As a monocrop, their height is restricted to 4-6 m giving a columnar appearance. In India the most common support trees used are *Erythrina* spp., *Garuga pinnata* and *Grevilea robusta*. Usually about 1600 vines are planted per hectare with 2.5 x 2.5 m spacing. Rooted cuttings are used as planting material. The vines start flowering after 2nd year of planting in May-June and the mature spikes become ready for harvest in December.

Black pepper grows successfully between 20° North and 20° South of Equator, and from sea level up to 1500m above MSL. The crop tolerates temperatures between 10°-40°C. Pepper is grown as rainfed crop and a well distributed annual rainfall of 125-200 cm is considered ideal. Pepper can be grown in a wide range of soils with a pH of 4.5 - 6.0. Well drained red lateritic or alluvial soils rich in humus are ideal. A fertilizer dose of 100g N, 40g P₂O₅ and 140g of K₂O per vine per year in two split doses one in April-May and another in August-September is recommended for better yields. Besides, farm yard manure may be given at the rate of 10 kg per vine.

Foot rot caused by the fungus *Phytophthora capsici*; slow decline caused by the nematodes viz., *Radopholus similis* and *Meloidogyne incognita*; hollow berries ("pollu") caused by a beetle *Longitarsus nigripennis*, are the major production constraints. Spraying the vines with 1% bordeaux mixture, application of bordeaux paste to the collar and drenching the basin with 2-3 litres of 1% bordeaux mixture once in May-June and again during August-September are recommended for the control of 'Phytophthora foot rot', along with phytosanitary measures. Application of phorate at the rate of 30g/vine twice a year is recommended for the control of the nematodes *R. similis* and *M. incognita*. Spraying of 0.05% endosulfan or quinalphos twice a year during June-July and September-October is effective in controlling the pests.

01. CROP : BLACK PEPPER
 02. VARIETY : Panniyur-1
 03. YEAR OF RELEASE : 1971
 04. INSTITUTE : Pepper Research Station, Kerala Agricultural University, Panniyur, Taliparamba - 670 141, Cannanore Dist., Kerala.
 05. PEDIGREE : A hybrid between Uthirankotta and Cheriyanakiakadan



Fig.1 Panniyur-1 with spikes

06. AREAS OF ADOPTION : All pepper growing tracts of Kerala
07. MATURITY GROUP : Medium
08. AVERAGE YIELD : 1242 kg dry pepper/ha
09. POTENTIAL YIELD : 8800 kg dry pepper/ha
10. QUALITY ATTRIBUTES : Piperine: 5.3% Oleoresin: 11.8% Essential oil: 3.5%
11. MORPHOLOGICAL CHARACTERS (recorded at 5th year of planting):
- | | | | |
|------------------------------|--------------------|------------------------------|-----------------------|
| 11.1 Leaf length/breadth(cm) | : 14.9/10.8 | 11.5 Setting(%) | : 96 |
| 11.2 Leaf shape | : Cordate | 11.6 No. of fruits per spike | : 125 |
| 11.3 Spike length (cm) | : 17.0 | 11.7 1000 fruit volume (cc) | : 145 |
| 11.4 Spike composition | | 11.8 1000 fruit weight(g) | : 155 |
| | Bisexual % : 99.92 | 11.9 Yield per vine | : 2.2 kg green pepper |
| | Female % : 0.07 | | |
| | Male % : 0.01 | 11.10 Dry recovery (%) | : 35.3 |
12. REACTION TO MAJOR PESTS AND DISEASES:
- | | |
|---|---------------|
| 12.1 Phytophthora foot rot (<i>Phytophthora capsici</i>) | : Susceptible |
| 12.2 Pollu beetle (<i>Longitarsus nigripennis</i>) | : Susceptible |
| 12.3 Burrowing nematode (<i>Radopholus similis</i>) | : Susceptible |
| 12.4 Root knot nematode (<i>Meloidogyne incognita</i>) | : Susceptible |
| 12.5 Leaf gall thrips (<i>Liothrips karnyi</i>) | : Susceptible |
| 12.6 Scale insects (<i>Lepidosaphes sp. & Aspidiotus sp.</i>) | : Susceptible |
13. SPECIFIC CHARACTERISTICS : Panniyur-1 is a vigorous vine with typical yellowish green shoot tips and cordate leaves. The spikes are long with high piperine content.
14. SPECIFIC RECOMMENDATIONS : Use only clonal planting material. The package of practices recommended by Kerala Agricultural University are to be followed. Yield of Panniyur-1 is poor in heavily shaded conditions.

01. CROP : BLACK PEPPER
 02. VARIETY : Panniyur-2
 03. YEAR OF RELEASE : 1989
 04. INSTITUTE : Pepper Research Station, (Kerala Agricultural University), Panniyur, Taliparamba - 670 141, Cannanore Dist., Kerala.
 05. PEDIGREE : Selection (Cul.141) from open pollinated progeny of cv. Balancotta



Fig.2 Mature spikes of Panniyur-2

06. AREAS OF ADOPTION : All pepper growing tracts of Kerala
 07. MATURITY GROUP : Medium
 08. AVERAGE YIELD : 2570 kg dry pepper/ha
 09. POTENTIAL YIELD : 3313 kg dry pepper/ha
 10. QUALITY ATTRIBUTES : Piperine: 6.6% Oleoresin: 10.9% Essential oil: -
11. MORPHOLOGICAL CHARACTERS (recorded at 5th year of planting):
- | | |
|---|---|
| 11.1 Leaf length/breadth (cm) : 14.9/10.8 | 11.5 Setting (%) : 74.2 |
| 11.2 Leaf shape : Cordate | 11.6 No. of fruits per spike : 44.5 |
| 11.3 Spike length(cm) : 12.3 | 11.7 1000 fruit volume (cc) : 120 |
| 11.4 Spike composition | 11.8 1000 fruit weight (g) : 127 |
| Bisexual % : 96.7 | 11.9 Yield per vine : 4.5 kg green pepper |
| Female % : 3.3 | |
| Male % : 0.0 | 11.10 Dry recovery (%) : 35.7 |
12. REACTION TO MAJOR PESTS AND DISEASES:
- | | |
|--|---------------|
| 12.1 Phytophthora foot rot (<i>Phytophthora capsici</i>) | : Susceptible |
| 12.2 Pollu beetle (<i>Longitarsus nigripennis</i>) | : Susceptible |
| 12.3 Burrowing nematode (<i>Radopholus similis</i>) | : Susceptible |
| 12.4 Root knot nematode (<i>Meloidogyne incognita</i>) | : Susceptible |
| 12.5 Leaf gall thrips (<i>Liothrips karnyi</i>) | : Susceptible |
| 12.6 Scale insects (<i>Lepidosaphes sp.</i> & <i>Aspidiotus sp.</i>) | : Susceptible |
13. SPECIAL CHARACTERISTICS : Appreciably shade tolerant. A high yielding variety with high piperine.
14. SPECIFIC RECOMMENDATIONS : Use only clonal planting material. The package of practices recommended by the Kerala Agricultural University are to be followed. Strict plant protection measures recommended.

01. CROP : BLACK PEPPER
 02. VARIETY : Panniyur-3
 03. YEAR OF RELEASE : 1989
 04. INSTITUTE : Pepper Research Station, Kerala Agricultural University, Panniyur, Taliparamba - 670 141, Cannanore Dist., Kerala.
 05. PEDIGREE : Hybrid (Cul.331) between Uthirankotta and Cheriyaaniakadan

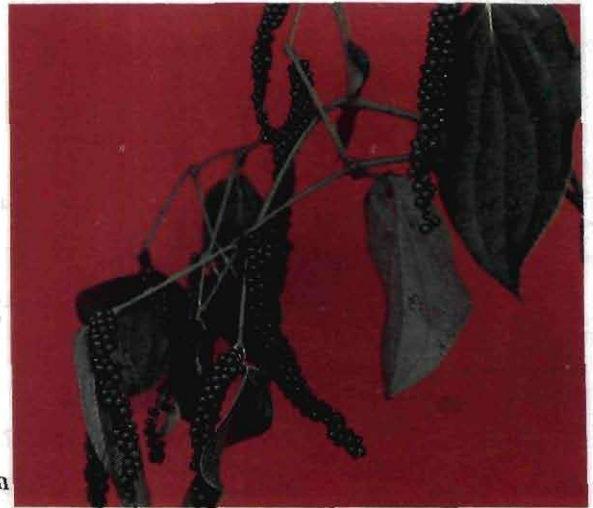


Fig.3 Mature spikes of Panniyur-3

06. AREAS OF ADOPTION : All pepper growing tracts of Kerala
 07. MATURITY GROUP : Late
 08. AVERAGE YIELD : 1953 kg dry pepper/ha
 09. POTENTIAL YIELD : 3269 kg dry pepper/ha
 10. QUALITY ATTRIBUTES : Piperine: 5.2% Oleoresin: 12.7% Essential oil: -
11. MORPHOLOGICAL CHARACTERS (recorded at 5th year of planting):
- | | | | | | |
|------|--------------------------|-------------------|-------|-------------------------|----------|
| 11.1 | Leaf length/breadth (cm) | : 12.6/9.4 | 11.5 | Setting (%) | : 89.2 |
| 11.2 | Leaf shape | : Roughly cordate | 11.6 | No. of fruits per spike | : 68.1 |
| 11.3 | Spike length (cm) | : 14.5 | 11.7 | 1000 fruit volume (cc) | : 137 |
| 11.4 | Spike composition | | 11.8 | 1000 fruit weight (g) | : 153 |
| | Bisexual % | : 99.9 | 11.9 | Yield per vine | : 4.4 kg |
| | Female % | : 0.1 | | green pepper | |
| | Male | : 0.0 | 11.10 | Dry recovery (%) | : 27.8 |
12. REACTION TO MAJOR PESTS AND DISEASES:
- | | | |
|------|--|---------------|
| 12.1 | Phytophthora foot rot (<i>Phytophthora capsici</i>) | : Susceptible |
| 12.2 | Pollu beetle (<i>Longitarsus nigripennis</i>) | : Susceptible |
| 12.3 | Burrowing nematode (<i>Radopholus similis</i>) | : Susceptible |
| 12.4 | Root knot nematode (<i>Meloidogyne incognita</i>) | : Susceptible |
| 12.5 | Leaf gall thrips (<i>Liothrips karnyi</i>) | : Susceptible |
| 12.6 | Scale insects (<i>Lepidosaphes sp. & Aspidiotus sp.</i>) | : Susceptible |
13. SPECIAL CHARACTERISTICS : A variety with very long spikes bold berries and high piperine content. Prefers open situations
14. SPICIFIC RECOMMENDATIONS : Use only clonal planting material. The package of practices recommended by Kerala Agricultural University are to be followed. Strict plant protection measures recommended.

01. CROP : BLACK PEPPER
 02. VARIETY : Panniyur-4
 03. YEAR OF RELEASE : 1989
 04. INSTITUTE : Pepper Research Station, Kerala Agricultural University, Panniyur, Taliparamba - 670 141, Cannanore Dist., Kerala.

05. PEDIGREE : Selection from Kuthiravally type-2

06. AREAS OF ADOPTION : All pepper growing tracts of Kerala

07. MATURITY GROUP : Late

08. AVERAGE YIELD : 1277 kg dry pepper/ha

09. POTENTIAL YIELD : 2443 kg dry pepper/ha

10. QUALITY

ATTRIBUTES : Piperine: - Oleoresin: 9.2% Essential oil: -

11. MORPHOLOGICAL CHARACTERS (recorded at 5th year of planting):

11.1 Leaf length/breadth (cm) : 13.6/10.3	11.5 Setting (%) : 85.7
11.2 Leaf shape : Cordate	11.6 No. of fruits per spike : 37.8
11.3 Spike length (cm) : 9.3	11.7 1000 fruit volume (cc) : 112
11.4 Spike composition	11.8 1000 fruit weight (g) : 116
Bisexual % : 96.4	11.9 Yield per vine : 2.3 kg green pepper
Female % : 3.6	
Male % : 0.0	11.10 Dry recovery (%) : 34.7

12. REACTION TO MAJOR PESTS AND DISEASES:

12.1 Phytophthora foot rot (<i>Phytophthora capsici</i>)	: Susceptible
12.2 Pollu beetle (<i>Longitarsus nigripennis</i>)	: Susceptible
12.3 Burrowing nematode (<i>Radopholus similis</i>)	: Susceptible
12.4 Root knot nematode (<i>Meloidogyne incognita</i>)	: Susceptible
12.5 Leaf gall thrips (<i>Liothrips karnyi</i>)	: Susceptible
12.6 Scale insects (<i>Lepidosaphes sp.</i> & <i>Aspidiotus sp.</i>)	: Susceptible

13. SPECIAL CHARACTERISTICS

: Performs well even under adverse climatic conditions including partial shade.

14. SPECIFIC RECOMMENDATIONS

: Use only clonal planting material. The package of practices recommended by Kerala Agricultural University are to be followed. Strict plant protection measures recommended.



Fig.4 Mature spikes of Panniyur-4

01. CROP : BLACK PEPPER
 02. VARIETY : Subhakara
 03. YEAR OF RELEASE : 1990
 04. INSTITUTE : National Research Centre for Spices (ICAR), Calicut - 673 012, Kerala.
 05. PEDIGREE : Selection from Karimunda (KS 27)
 06. AREAS OF ADOPTION : All pepper growing tracts of Kerala and Southern Karnataka
 07. MATURITY GROUP : Medium
 08. AVERAGE YIELD : 2352 kg dry pepper/ha
 09. POTENTIAL YIELD : 4487 kg dry pepper/ha
 10. QUALITY ATTRIBUTES : Piperine: 3.4% Oleoresin: 12.4% Essential oil: 6.0%



Fig.5 Bearing vine of Subhakara

11. MORPHOLOGICAL CHARACTERS (recorded at 5th year of planting):
- | | | | |
|-------------------------------|------------|------------------------------|-----------------------|
| 11.1 Leaf length/breadth (cm) | : 12.3/6.5 | 11.5 Setting (%) | : 68 |
| 11.2 Leaf shape | : Ovate | 11.6 No. of fruits per spike | : 63 |
| 11.3 Spike length(cm) | : 7.7 | 11.7 1000 fruit volume (cc) | : 100 |
| 11.4 Spike composition | | 11.8 1000 fruit weight (g) | : 103 |
| Bisexual % | : 99.0 | 11.9 Yield per vine | : 4.2 kg green pepper |
| Female % | : 0.5 | 11.10 Dry recovery (%) | : 35.5 |
| Male % | : 0.5 | | |
12. REACTION TO MAJOR PESTS AND DISEASES:
- | | |
|---|---------------|
| 12.1 Phytophthora foot rot (<i>Phytophthora capsici</i>) | : Susceptible |
| 12.2 Pollu beetle (<i>Longitarsus nigripennis</i>) | : Susceptible |
| 12.3 Burrowing nematode (<i>Radopholus similis</i>) | : Susceptible |
| 12.4 Root knot nematode (<i>Meloidogyne incognita</i>) | : Susceptible |
| 12.5 Leaf gall thrips (<i>Liothrips karnyi</i>) | : Susceptible |
| 12.6 Scale insects (<i>Lepidosaphes sp. & Aspidiotus sp.</i>) | : Susceptible |
13. SPECIAL CHARACTERISTICS : A selection with high quality pepper and wider adaptability
14. SPECIFIC RECOMMENDATIONS : Use only clonal planting material. The package of practices recommended by the NRCS are to be followed.

01. CROP : BLACK PEPPER
 02. VARIETY : Sreekara
 03. YEAR OF RELEASE : Proposed for release in 1990
 04. INSTITUTE : National Research Centre for Spices (ICAR), Calicut - 673 012, Kerala.
 05. PEDIGREE : Selection from Karimunda (KS 14)
 06. AREAS OF ADOPTION : All pepper growing tracts of Kerala and Southern Karnataka

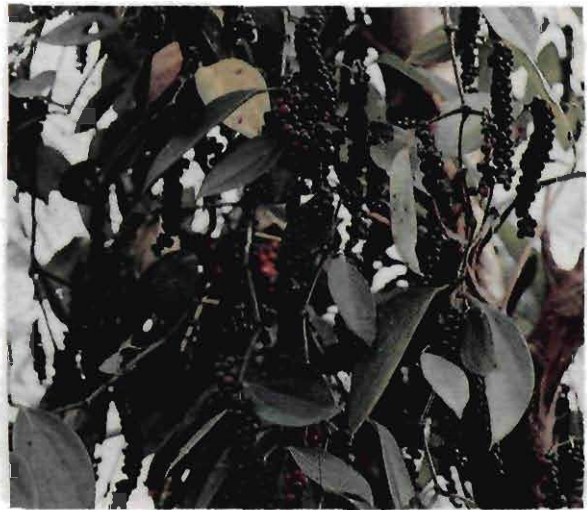


Fig.6 Bearing vine of Sreekara

07. MATURITY GROUP : Medium
 08. AVERAGE YIELD : 2677 kg dry pepper/ha
 09. POTENTIAL YIELD : 4200 kg dry pepper/ha
 10. QUALITY ATTRIBUTES : Piperine: 5.1% Oleoresin: 13.0% Essential oil: 7.0%
11. MORPHOLOGICAL CHARACTERS (recorded at 5th year of planting):
- | | | | |
|-------------------------------|------------|------------------------------|-----------------------|
| 11.1 Leaf length/breadth (cm) | : 11.6/6.2 | 11.5 Setting (%) | : 63.4 |
| 11.2 Leaf shape | : Ovate | 11.6 No. of fruits per spike | : 61 |
| 11.3 Spike length(cm) | : 8.6 | 11.7 1000 fruit volume (cc) | : 106 |
| 11.4 Spike composition | | 11.8 1000 fruit weight (g) | : 108 |
| Bisexual % | : 98.0 | 11.9 Yield per vine | : 4.8 kg green pepper |
| Female % | : 1.0 | | |
| Male % | : 1.0 | 11.10 Dry recovery (%) | : 35 |
12. REACTION TO MAJOR PESTS AND DISEASES:
- | | |
|---|---------------|
| 12.1 Phytophthora foot rot (<i>Phytophthora capsici</i>) | : Susceptible |
| 12.2 Pollu beetle (<i>Longitarsus nigripennis</i>) | : Susceptible |
| 12.3 Burrowing nematode (<i>Radopholus similis</i>) | : Susceptible |
| 12.4 Root knot nematode (<i>Meloidogyne incognita</i>) | : Susceptible |
| 12.5 Leaf gall thrips (<i>Liothrips karnyi</i>) | : Susceptible |
| 12.6 Scale insects (<i>Lepidosaphes sp. & Aspidiotus sp.</i>) | : Susceptible |
13. SPECIAL CHARACTERISTICS : Adaptable to various climatic conditions in all the pepper growing tracts. Gives high quality pepper.
14. SPECIFIC RECOMMENDATIONS : Use only clonal planting material. The plant protection measures and package of practices recommended by the NRCS are to be followed.

01. CROP : BLACK PEPPER
 02. VARIETY : Panchami
 03. YEAR OF RELEASE : Proposed for release in 1991
 04. INSTITUTE : National Research Centre for Spices (ICAR), Calicut - 673 012, Kerala.
 05. PEDIGREE : Selection from Aimpriyan (Coll.856)
 06. AREAS OF ADOPTION : All pepper growing tracts of Kerala and Karnataka



Fig.7 Mature spikes of Panchami

07. MATURITY GROUP : Late
 08. AVERAGE YIELD : 2828 kg dry pepper/ha
 09. POTENTIAL YIELD : 6528 kg dry pepper/ha
 10. QUALITY ATTRIBUTES : Piperine: 4.7 % Oleoresin: 12.5 % Essential oil: 3.4%

11. MORPHOLOGICAL CHARACTERS (recorded at 5th year of planting):

- | | |
|--|---|
| 11.1 Leaf length/breadth (cm) : 14.5/8.5 | 11.5 Setting (%) : 82 |
| 11.2 Leaf shape : Ovate | 11.6 No. of fruits per spike : 84 |
| 11.3 Spike length (cm) : 11.2 | 11.7 1000 fruit volume (cc) : 108 |
| 11.4 Spike composition | 11.8 1000 fruit weight (g) : 107 |
| Bisexual % : 95.5 | 11.9 Yield per vine : 5.2 kg green pepper |
| Female % : 4.0 | |
| Male % : 0.5 | 11.10 Dry recovery (%) : 34 |

12. REACTION TO MAJOR PESTS AND DISEASES:

- | | |
|---|---------------|
| 12.1 Phytophthora foot rot (<i>Phytophthora capsici</i>) | : Susceptible |
| 12.2 Pollu beetle (<i>Longitarsus nigripennis</i>) | : Susceptible |
| 12.3 Burrowing nematode (<i>Radopholus similis</i>) | : Susceptible |
| 12.4 Root knot nematode (<i>Meloidogyne incognita</i>) | : Susceptible |
| 12.5 Leaf gall thrips (<i>Liothrips karnyi</i>) | : Susceptible |
| 12.6 Scale insects (<i>Lepidosaphes sp. & Aspidiotus sp.</i>) | : Susceptible |

13. SPECIAL CHARACTERISTICS : A high yielding variety with excellent fruit set. Spike twisted in appearance due to high fruit set. Oleoresin content is high.

14. SPECIFIC RECOMMENDATIONS : Use only clonal planting material. Strict plant protection measures recommended. May not be suitable for drought prone areas. Package of practices recommended by NRCS are to be followed.

01. CROP : BLACK PEPPER
 02. VARIETY : Panchami
 03. YEAR OF RELEASE : Proposed for release in 1991
 04. INSTITUTE : National Research Centre for Spices (ICAR), Calicut - 673 012, Kerala.
 05. PEDIGREE : Selection from Aimpiriyan (Coll.856)
 06. AREAS OF ADOPTION : All pepper growing tracts of Kerala and Karnataka



Fig.7 Mature spikes of Panchami

07. MATURITY GROUP : Late
 08. AVERAGE YIELD : 2828 kg dry pepper/ha
 09. POTENTIAL YIELD : 6528 kg dry pepper/ha
 10. QUALITY ATTRIBUTES : Piperine: 4.7 % Oleoresin: 12.5 % Essential oil: 3.4%
11. MORPHOLOGICAL CHARACTERS (recorded at 5th year of planting):
- | | | | |
|-------------------------------|-------------------|------------------------------|-----------------------|
| 11.1 Leaf length/breadth (cm) | : 14.5/8.5 | 11.5 Setting (%) | : 82 |
| 11.2 Leaf shape | : Ovate | 11.6 No. of fruits per spike | : 84 |
| 11.3 Spike length (cm) | : 11.2 | 11.7 1000 fruit volume (cc) | : 108 |
| 11.4 Spike composition | | 11.8 1000 fruit weight (g) | : 107 |
| | Bisexual % : 95.5 | 11.9 Yield per vine | : 5.2 kg green pepper |
| | Female % : 4.0 | | |
| | Male % : 0.5 | 11.10 Dry recovery (%) | : 34 |
12. REACTION TO MAJOR PESTS AND DISEASES:
- | | |
|---|---------------|
| 12.1 Phytophthora foot rot (<i>Phytophthora capsici</i>) | : Susceptible |
| 12.2 Pollu beetle (<i>Longitarsus nigripennis</i>) | : Susceptible |
| 12.3 Burrowing nematode (<i>Radopholus similis</i>) | : Susceptible |
| 12.4 Root knot nematode (<i>Meloidogyne incognita</i>) | : Susceptible |
| 12.5 Leaf gall thrips (<i>Liothrips karnyi</i>) | : Susceptible |
| 12.6 Scale insects (<i>Lepidosaphes sp. & Aspidiotus sp.</i>) | : Susceptible |
13. SPECIAL CHARACTERISTICS : A high yielding variety with excellent fruit set. Spike twisted in appearance due to high fruit set. Oleoresin content is high.
14. SPECIFIC RECOMMENDATIONS : Use only clonal planting material. Strict plant protection measures recommended. May not be suitable for drought prone areas. Package of practices recommended by NRCS are to be followed.

01. CROP : BLACK PEPPER
 02. VARIETY : **Ottaplackal-1**
 03. YEAR OF RELEASE : Proposed for release in 1991
 04. INSTITUTE : National Research Centre for Spices (ICAR), Calicut - 673 012, Kerala.
 05. PEDIGREE : Selection from the germplasm (coll.812)
 06. AREAS OF ADOPTION : All pepper growing tracts of Kerala and Karnataka

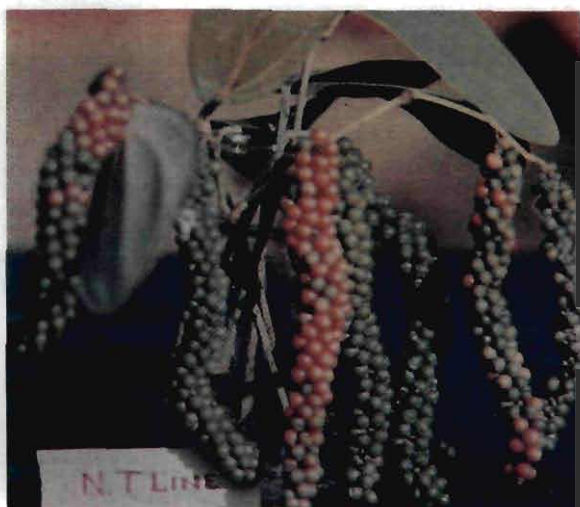


Fig.8 Mature spikes of Ottaplackal-1

07. MATURITY GROUP : Medium
 08. AVERAGE YIELD : 2333 kg dry pepper/ha
 09. POTENTIAL YIELD : 5356 kg dry pepper/ha
 10. QUALITY ATTRIBUTES : Piperine: 4.1% Oleoresin: 13.8% Essential oil: 3.4%

11. MORPHOLOGICAL CHARACTERS (recorded at 5th year of planting):

- | | |
|---|---|
| 11.1 Leaf length/breadth(cm) : 15.6/8.5 | 11.5 Setting (%) : 68 |
| 11.2 Leaf shape : Ovate-lanceolate | 11.6 No. of fruits per spike : 79 |
| 11.3 Spike length (cm) : 12 | 11.7 1000 fruit volume (cc) : 130 |
| 11.4 Spike composition | 11.8 1000 fruit weight (g) : 128 |
| Bisexual % : 84.0 | 11.9 Yield per vine : 4.7 kg green pepper |
| Female % : 15.0 | 11.10 Dry recovery (%) : 31 |
| Male % : 1.0 | |

12. REACTION TO MAJOR PESTS AND DISEASES:

- | | |
|---|---------------|
| 12.1 Phytophthora foot rot (<i>Phytophthora capsici</i>) | : Susceptible |
| 12.2 Pollu beetle (<i>Longitarsus nigripennis</i>) | : Susceptible |
| 12.3 Burrowing nematode (<i>Radopholus similis</i>) | : Susceptible |
| 12.4 Root knot nematode (<i>Meloidogyne incognita</i>) | : Tolerant |
| 12.5 Leaf gall thrips (<i>Liothrips karnyi</i>) | : Susceptible |
| 12.6 Scale insects (<i>Lepidosaphes sp. & Aspidiotus sp.</i>) | : Susceptible |

13. SPECIAL CHARACTERISTICS : Tolerant to root knot nematode. A moderately high yielding vine with high oleoresin content.

14. SPECIFIC RECOMMENDATIONS : Use only clonal planting material. Strict plant protection measures recommended. Package of practices recommended by NRCS are to be followed.

SMALL CARDAMOM

Known as the “Queen of the Spices”, small cardamom is the dried capsules of perennial herb *Elettaria cardamomum* Maton of the family Zingiberaceae. The plant is indigenous to evergreen forests of Southern India and Sri Lanka. Cardamom is grown in areas where the rainfall ranges from 1500-4000 mm, temperature from 10-35° C and the altitude from 600-1200 m above MSL. Loamy forest soils rich in organic matter with pH ranging from 5.0 - 6.5 are ideal. Cardamom also requires over head shade.

India, Sri Lanka and Guatemala are the major cardamom producing countries. In India, cardamom is cultivated in an area over 1,05,000 hectares and its cultivation is restricted to Western Ghat regions of Kerala, Karnataka and Tamil Nadu. Among the cultivated types of cardamom, three major races viz., Malabar, Mysore and Vazhukka are recognised. Cardamom is usually cultivated as a rainfed crop, but supplementary irrigation is provided in certain pockets to overcome dry spells during summer. Cardamom is vegetatively propagated but usually seedlings are used for planting due to lack of adequate clonal material. Plant population per hectare ranges from 1000 - 5000 depending upon the plant type and system of planting. It starts yielding by the third year after planting. The flowering commences in April and continues up to August. The fruits come to harvest 3-4 months after flowering. Rearing of honey bees in cardamom plantations help in increasing the yields.

A fertilizer dose of 30 : 60 : 30 kg of NPK per hectare is recommended in two split doses, along with compost at the rate of 5 kg per clump. Under irrigated conditions a higher dose of 75 : 75 : 150 of NPK is recommended.

Mosaic or ‘katte’ disease caused by virus, capsule rot (Azhukal) caused by *Phytophthora* sp., rhizome rot caused by *Pythium* sp., and *Rhizoctonia* sp., root knot nematode (*Meloidogyne incognita*), thrips (*Sciothrips cardamomi*), shoot and capsule borer (*Conogethes punctiferalis*) are the major diseases and pests affecting cardamom plantations. Use of disease free planting material, phytosanitation and controlling the vector population will help in minimising the incidence and spread of ‘katte’ disease. Spraying and drenching 1% bordeaux mixture will control capsule as well as rhizome rot. Application of 50 g of phorate to each infected clump is recommended to control root knot nematode. Spraying quinalphos 0.025% during March - September at monthly intervals will control thrips whereas spraying monocrotophos 0.075% is effective in controlling shoot and capsule borer.

01. CROP : SMALL CARDAMOM
02. VARIETY : **Mudigere-1**
Plant type : Malabar
03. YEAR OF RELEASE : 1984
04. INSTITUTE : RARS,
Univ. of Agr. Sciences,
Mudigere-577 132,
Karnataka.
05. PEDIGREE : Clonal Selection (P1)
from Malabar type
06. AREAS OF ADOPTION : In the traditional
cardamom growing
areas of Karnataka
07. MATURITY : 125 days from
flowering to fruit
08. AVERAGE YIELD : 275 kg dry capsules/ha
09. POTENTIAL YIELD : 1000 kg dry capsules/ha
10. QUALITY : Essential oil: 8%
ATTRIBUTES α - terpenyl acetate: 42.3%



Fig.9 Bearing clump of Mudigere-1

11. MORPHOLOGICAL CHARACTERS:

- | | | | |
|---------------------------------|------------|--------------------------------|----------------|
| 11.1 Colour of aerial shoot | : Green | 11.7 No. capsule per panicle | : 30 |
| 11.2 Plant height (cm) | : 275 | 11.8 Capsule shape | : Oval |
| 11.3 Leaf length/breadth (cm) | : 52.5/9.4 | 11.9 Capsule size (cc) | : 1.0 |
| 11.4 No. of tillers per clump | : 16 | 11.10 Wt. of capsule (g) | : 0.75 (green) |
| 11.5 No. of panicles per clump | : 33 | 11.11 No. of seeds per capsule | : 19 |
| 11.6 No. of flowers per panicle | : 57 | 11.12 Yield per clump (g) | : 450 (green) |

12. REACTION TO MAJOR PESTS AND DISEASES:

- | | |
|--|---------------|
| 12.1 Thrips (<i>Sciothrips cardamomi</i>) | : Tolerant |
| 12.2 Shoot/panicle/capsule borer (<i>Conogethes punctiferalis</i>) | : Tolerant |
| 12.3 Root knot nematode (<i>Meloidogyne incognita</i>) | : - |
| 12.4 Katte disease (<i>Katte virus</i>) | : Susceptible |
| 12.5 Azhukal or capsule rot (<i>Phytophthora sp.</i>) | : Susceptible |
| 12.6 Rhizome rot (<i>Pythium vexans</i> & <i>Rhizoctonia solani</i>) | : Susceptible |

13. SPECIAL CHARACTERISTICS : It is a pubescent, erect and compact plant. Suitable for high density planting. Tolerant to hairy caterpillars and white grub.

14. SPECIFIC RECOMMENDATIONS : Use of clonal planting material recommended. Irrigation during Dec-Jan is beneficial.

01. CROP : SMALL CARDAMOM
02. VARIETY : PV-1
Plant type : Malabar
03. YEAR OF RELEASE : Proposed for release in 1991
04. INSTITUTE : Cardamom Res. Station, Kerala Agr. University, Pampadumpara -685 556, Kerala.
05. PEDIGREE : A selection from Walayar collections
06. AREAS OF ADOPTION : All cardamom growing areas of Kerala
07. MATURITY : 110 days from flowering to fruit



Fig.10 Dried capsules of PV-1

08. AVERAGE YIELD : 260 Kg dry capsules/ha
09. POTENTIAL YIELD : 500 Kg dry capsules/ha
10. QUALITY ATTRIBUTES : Essential oil: 6.8% Dry recovery: 19.9%
 α - terpenyl acetate: 46% 1,8 - Cineole: 33%

11. MORPHOLOGICAL CHARACTERS:

- | | | | | | |
|------|----------------------------|------------|-------|-----------------------------|----------------|
| 11.1 | Colour of aerial shoot | : Green | 11.7 | No. of capsules per panicle | : 49 |
| 11.2 | Plant height(cm) | : 269 | 11.8 | Capsule shape | : Long |
| 11.3 | Leaf length/breadth (cm) | : 59.9/9.1 | 11.9 | Capsule size (cc) | : 1.3 |
| 11.4 | No. of tillers per clump | : 39 | 11.10 | Wt. of capsule (g) | : 0.16 (dry) |
| 11.5 | No. of panicles per clump | : 26 | 11.11 | No. of seeds per capsule | : 17 |
| 11.6 | No. of flowers per panicle | : 79 | 11.12 | Yield per clump (g) | : 1310 (green) |

12. REACTION TO MAJOR PESTS AND DISEASES:

- | | | |
|------|---|-----------------------|
| 12.1 | Thrips (<i>Sciothrips cardamomi</i>) | : Susceptible |
| 12.2 | Shoot/panicle/capsule borer (<i>Conogethes punctiferalis</i>) | : Moderately tolerant |
| 12.3 | Root knot nematode (<i>Meloidogyne incognita</i>) | : Moderately tolerant |
| 12.4 | Katte disease (<i>Katte virus</i>) | : Susceptible |
| 12.5 | Azhukal or capsule rot (<i>Phytophthora sp.</i>) | : Susceptible |
| 12.6 | Rhizome rot (<i>Pythium vexans & Rhizoctonia solani</i>) | : Susceptible |

13. SPECIAL CHARACTERISTICS : An early maturing, highly adaptable variety with long ovoid and slightly ribbed light green capsule.

14. SPECIFIC RECOMMENDATIONS : Use of clonal planting material recommended. The package of practices recommended by Kerala Agricultural University are to be followed.

01. CROP : SMALL CARDAMOM
 02. VARIETY : Coorg Cardamom Selection - I (C.C.S.-1)
 Plant type : Malabar
 03. YEAR OF RELEASE : Proposed for release in 1991
 04. INSTITUTE : National Research Centre for Spices (ICAR), Cardamom Res. Centre, Appangala, Madikeri - 571 201, Karnataka.
 05. PEDIGREE : A selection from open pollinated progeny (No.872) of CL-37

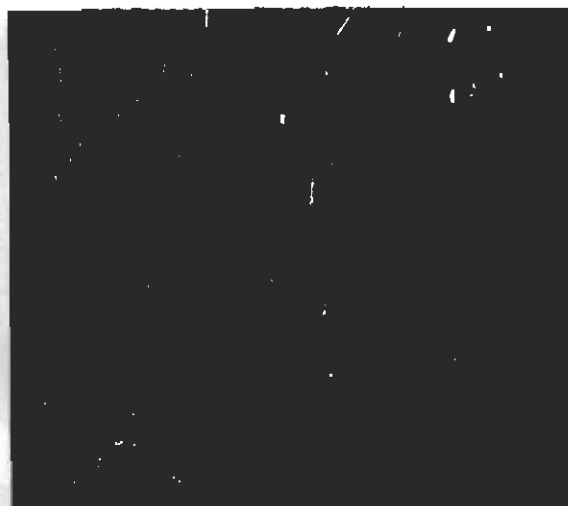


Fig.11 Bearing clump of CCS-1

06. AREAS OF ADOPTION : All cardamom growing tracts of Karnataka
 07. MATURITY : 110 days from flowering to fruit
 08. AVERAGE YIELD : 409 kg dry capsules/ha
 09. POTENTIAL YIELD : 1156 kg dry capsules/ha
 10. QUALITY ATTRIBUTES : Essential oil: 8.7%
 α -terpenyl acetate: 37%

Dry recovery: 22%
 1,8 - Cineole: 42%

11. MORPHOLOGICAL CHARACTERS:

- | | | | |
|---------------------------------|------------|----------------------------------|---------------|
| 11.1 Colour of aerial shoot | : Green | 11.7 No. of capsules per panicle | : 60 |
| 11.2 Plant height (cm) | : 129.6 | 11.8 Capsule shape | : Oblong |
| 11.3 Leaf length/breadth (cm) | : 59.8/7.2 | 11.9 Capsule size (cc) | : 0.9 |
| 11.4 No. of tillers per clump | : 13 | 11.10 Wt. of capsule (g) | : 0.24 (dry) |
| 11.5 No. of panicles per clump | : 8 | 11.11 No. of seeds per capsule | : 21.4 |
| 11.6 No. of flowers per panicle | : 129 | 11.12 Yield per clump (g) | : 409 (green) |

12. REACTION TO MAJOR PESTS AND DISEASES:

- | | |
|--|-----------------------|
| 12.1 Thrips (<i>Sciothrips cardamomi</i>) | : Moderately tolerant |
| 12.2 Shoot/panicle/capsule borer (<i>Conogethes punctiferalis</i>) | : Susceptible |
| 12.3 Root knot nematode (<i>Meloidogyne incognita</i>) | : Susceptible |
| 12.4 Katte disease (<i>Katte virus</i>) | : Susceptible |
| 12.5 Azhukal or capsule rot (<i>Phytophthora sp.</i>) | : Susceptible |
| 12.6 Rhizome rot (<i>Pythium vexans & Rhizoctonia solani</i>) | : Susceptible |

13. SPECIAL CHARACTERISTICS : An early maturing variety with bold capsules. Suitable for high density planting.
 14. SPECIFIC RECOMMENDATIONS : Use of clonal planting material recommended. High production technology recommended by NRCS is to be followed.

01. CROP : SMALL CARDAMOM
 02. VARIETY : ICRI-1
 Plant type : Malabar
 03. YEAR OF RELEASE : 1992
 04. INSTITUTE : ICRI (Spices Board),
 Myladumpara - 685 553,
 Kerala.
 05. PEDIGREE : A selection (MCC-49)
 from Chakkupallam
 collections
 06. AREAS OF ADOPTION : South Idukki zone of
 Kerala, where the
 rainfall is well
 distributed



Fig.12 Bearing clump of ICRI-1

07. MATURITY : 117 days from flowering to
 mature fruit
 08. AVERAGE YIELD : 325 kg dry capsules/ha
 09. POTENTIAL : 656 kg dry capsules/ha
 10. QUALITY : Essential oil: 8.3% Dry recovery: 22.9%
 ATTRIBUTES α - terpenyl acetate: 37.6% 1,8 Cineole: 28.8%

11. MORPHOLOGICAL CHARACTERS:

- | | | | |
|---------------------------------|------------|----------------------------------|----------------|
| 11.1 Colour of aerial shoot | : Green | 11.7 No. of capsules per panicle | : 313 |
| 11.2 Plant height (cm) | : 299.4 | 11.8 Capsule shape | : Round |
| 11.3 Leaf length/breadth (cm) | : 56.3/8.8 | 11.9 Capsule size (cc) | : 2.2 |
| 11.4 No. of tillers per clump | : 84 | 11.10 Wt. of capsule (g) | : 1.1 (green) |
| 11.5 No. of panicles per clump | : 70 | 11.11 No. of seeds per capsule | : 18.5 |
| 11.6 No. of flowers per panicle | : 330 | 11.12 Yield per clump (g) | : 2900 (green) |

12. REACTION TO MAJOR PESTS AND DISEASES:

- | | |
|--|---------------|
| 12.1 Thrips (<i>Sciothrips cardamomi</i>) | : Susceptible |
| 12.2 Shoot/panicle/capsule borer (<i>Conogethes punctiferalis</i>) | : Susceptible |
| 12.3 Root knot nematode (<i>Meloidogyne incognita</i>) | : Susceptible |
| 12.4 Katte disease (<i>Katte virus</i>) | : Susceptible |
| 12.5 Azhukal or capsule rot (<i>Phytophthora sp.</i>) | : Susceptible |
| 12.6 Rhizome rot (<i>Pythium vexans</i> & <i>Rhizoctonia solani</i>) | : Susceptible |

13. SPECIAL CHARACTERISTICS : A tall variety with an yield of 656 kg/ha under irrigated conditions. An early maturing profusely flowering variety with bold, dark green capsules.

14. SPECIFIC RECOMMENDATIONS : Use of clonal planting material recommended. Package of practices recommended by Indian Cardamom Research Institute are to be followed.

- 01. CROP : SMALL CARDAMOM
- 02. VARIETY : ICRI - 2
Plant type : Mysore
- 03. YEAR OF RELEASE : 1992
- 04. INSTITUTE : ICRI (Spices Board),
Myladumpara - 685 533,
Kerala.
- 05. PEDIGREE : A clonal selection
(MCC - 61) from
Pampadumpara
collection
- 06. AREAS OF ADOPTION : Vandanmedu and
Nelliyampathy zones of
Kerala; Anamalai &
Meghamalai Hills of
Tamil Nadu



Fig. 13 Bearing clump of ICRI - 2

- 07. MATURITY : 127 days from flowering to fruit
- 08. AVERAGE YIELD : 375 kg dry capsules/ha
- 09. POTENTIAL YIELD : 766 kg dry capsules/ha
- 10. QUALITY ATTRIBUTES : Essential oil: 9% Dry recovery: 22.5%
 α - terpenyl acetate: 36% 1,8 - Cineole: 29.3%
- 11. MORPHOLOGICAL CHARACTERS:
 - 11.1 Colour of aerial shoot : Green
 - 11.2 Plant height (cm) : 275
 - 11.3 Leaf length/breadth (cm) : 67.1/13.4
 - 11.4 No. of tillers per clump : 76
 - 11.5 No. of panicles per clump : 55
 - 11.6 No. of flowers per panicle : 220
 - 11.7 No. of capsules per panicle: 175
 - 11.8 Capsule shape : Oblong
 - 11.9 Capsule size (cc) : 2.8
 - 11.10 Wt. of capsule (g) : 1.26 (green)
 - 11.11 No. of seeds per capsule : 16.9
 - 11.12 Yield per clump (g) : 3450 (green)
- 12. REACTION TO MAJOR PESTS AND DISEASES:
 - 12.1 Thrip (*Sciothrips cardamomi*) : Susceptible
 - 12.2 Shoot/panicle/capsule borer (*Conogethes punctiferalis*) : Susceptible
 - 12.3 Root knot nematode (*Meloidogyne incognita*) : Susceptible
 - 12.4 Katte disease (*Katte virus*) : Susceptible
 - 12.5 Azhukal or capsule rot (*Phytophthora sp.*) : Field tolerant
 - 12.6 Rhizome rot (*Pythium vexans & Rhizoctonia solani*) : Susceptible
- 13. SPECIAL CHARACTERISTICS : Performs well under irrigated conditions giving an
yield of 766 kg/ha. Suitable for higher altitudes. It
has long, bold and parrot green capsules.
- 14. SPECIFIC RECOMMENDATIONS : Use of clonal planting material recommended.
Package of practices recommended by Indian
Cardamom Research Institute are to be followed.

GINGER

Ginger is derived from the rhizomes of *Zingiber officinale* Rosc. (Family - Zingiberaceae). It is said to have originated in Indo-China region and is not known to occur in wild state. Ginger is a slender perennial herb usually grown as annual, 30-100 cm tall with robust, thick, branched and laterally compressed rhizomes. The rhizomes are 1.5 - 2.5 cm in diameter and pale yellow within. The leafy shoots are erect and bear 8-12 linear lanceolate leaves.

Ginger grows well in warm and humid tropics from sea level up to 1500 m above MSL. It is usually grown as rainfed crop and moderate to heavy rainfall is ideal. It thrives best in well drained sandy, clay loam, red loam or lateritic loam soils rich in humus. It is very sensitive to water logging. Ginger is cultivated in over 53,000 hectares in India and the major producing states are Kerala, Himachal Pradesh, Orissa, West Bengal and North Eastern States.

Ginger is propagated only vegetatively using bits of rhizomes as planting material. The seed rhizomes are to be selected after each harvest and stored properly in shade for planting in the next season. The field is loosened and prepared with the onset of monsoon. A seed rate of 1.5 - 2.5 t/ha is used. Compost or FYM at the rate of 25-30 t/ha is applied at the time of preparing bed and application of NPK at the rate of 75 : 50 : 50 Kg/ha in 3 split doses is recommended for better yields. Mulching with green leaves at the rate of 10-12 t/ha at the time of planting and 5 t/ha at the time of subsequent fertilizer applications is recommended. The crop is ready for harvest 6-8 months after planting. Being a very exhaustive crop it is not desirable to grow ginger in the same site year after year.

Rhizome rot caused by *Pythium apanidermatum*, bacterial wilt caused by *Pseudomonas solanacearum*, leaf spot caused by *Phyllosticta zingiberi* are the major diseases and shoot borer (*Conogethes punctiferalis*) and rhizome scale (*Aspidiella hartii*) are the major pests affecting ginger. Treating seed rhizomes with 0.3% dithane M-45, and 200 ppm streptomycin before planting and drenching the affected sites with 1% bordeaux mixture controls rhizome rot and bacterial wilt respectively, while spraying 1% bordeaux mixture controls leaf spot. Spraying 0.1% malathion or 0.05% monocrotophos at monthly intervals during July-October controls shoot borer and treating the rhizomes with 0.1% quinalphos twice - once before storing and again during planting controls rhizome scale.

01. CROP : GINGER
02. VARIETY : **Suprabha**
03. YEAR OF RELEASE : 1988
04. INSTITUTE : High Altitude Research Station, Orissa Univ. of Agriculture & Technology, Pottangi - 764 039, Orissa.
05. PEDIGREE : A clonal selection (PGS-35) from Kunduli local
06. AREAS OF ADOPTION : All the ginger growing tracts of Orissa
07. MATURITY : 229 days
08. AVERAGE YIELD : 16.6 tonnes fresh rhizomes/ha
09. POTENTIAL YIELD : 22.8 tonnes fresh rhizomes/ha
10. QUALITY ATTRIBUTES : Oleoresin: 8.9% Essential oil: 1.9%



Fig.14 Rhizomes of Suprabha

11. MORPHOLOGICAL CHARACTERS:

- | | | | |
|-------------------------------|------------|---|------------------|
| 11.1 Colour of aerial shoot | : Green | 11.6 Colour of rhizome core | : Whitish yellow |
| 11.2 Plant height (cm) | : 51.8 | 11.7 Weight of fresh rhizomes per clump (g) | : 200 |
| 11.3 Leaf length/breadth(cm) | : 17.0/1.9 | 11.8 Dry recovery (%) | : 20.5 |
| 11.4 No. of tillers per clump | : 11.1 | 11.9 Crude fibre (%) | : 4.4 |
| 11.5 No. of leaves per tiller | : 14.4 | | |

12. REACTION TO MAJOR PESTS AND DISEASES:

- | | |
|---|---------------|
| 12.1 Rhizome rot (<i>Pythium aphanidermatum</i>) | : Susceptible |
| 12.2 Bacterial wilt (<i>Pseudomonas solanacearum</i>) | : Susceptible |
| 12.3 Leaf spot (<i>Phyllosticta zingiberi</i>) | : Susceptible |
| 12.4 Shoot borer (<i>Conogethes punctiferalis</i>) | : Susceptible |
| 12.5 Rhizome scales (<i>Aspidiella hartii</i>) | : Susceptible |

13. SPECIAL CHARACTERISTICS : Plumpy flat rhizomes with bright glazy skin and brown scales. Suitable for both green and dry ginger. Performs well in hilly areas, drought prone areas and in both early and late sowing conditions.

14. SPECIFIC RECOMMENDATIONS : Use only disease free clonal planting material. NPK at the rate of 75:50:50 kg/ha is recommended at 3 split doses along with 25 t/ha FYM and 15t/ha mulch at planting and 5 t/ha after each fertilizer application. Seed rate 18Q/ha is recommended. Recommended package of practices of OUAT are to be followed.

01. CROP : GINGER
02. VARIETY : **Suruchi**
03. YEAR OF RELEASE : 1990
04. INSTITUTE : High Altitude
Research Station,
Orissa Univ. of
Agriculture and
Technology,
Pottangi - 764 039,
Orissa.
05. PEDIGREE : A clonal selection
(PGS-19) from Kunduli
local
06. AREAS OF
ADOPTION : All ginger growing
tracts of Orissa
07. MATURITY : 218 days
08. AVERAGE YIELD : 11.6 tons of fresh rhizomes/ha
09. POTENTIAL YIELD : 21.8 tons of fresh rhizomes/ha
10. QUALITY : Oleoresin: 10.0% Essential oil: 2.0%
- ATTRIBUTES

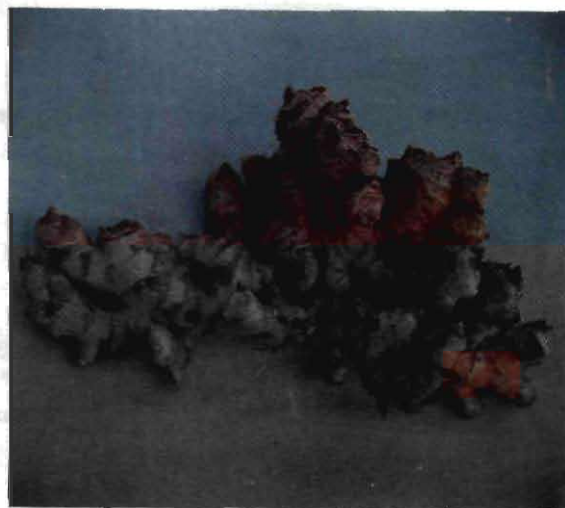


Fig.15 Rhizomes of Suruchi

11. MORPHOLOGICAL CHARACTERS:

- | | | | |
|-------------------------------|------------|-------------------------------|-----------------|
| 11.1 Colour of aerial shoot | : Green | 11.6 Colour of rhizome core: | Greenish yellow |
| 11.2 Plant height (cm) | : 51.3 | 11.7 Weight of fresh rhizomes | |
| 11.3 Leaf length/breadth (cm) | : 17.7/1.9 | per clump (g) | : 205 |
| 11.4 No. of tillers per clump | : 11.8 | 11.8 Dry recovery (%) | : 23.5 |
| 11.5 No. of leaves per tiller | : 13.5 | 11.9 Crude fibre (%) | : 3.8 |

12. REACTION TO MAJOR PESTS AND DISEASES:

- | | |
|---|---------------|
| 12.1 Rhizome rot (<i>Pythium aphanidermatum</i>) | : Susceptible |
| 12.2 Bacterial wilt (<i>Pseudomonas solanacearum</i>) | : Susceptible |
| 12.3 Leaf spot (<i>Phyllosticta zingiberi</i>) | : Susceptible |
| 12.4 Shoot borer (<i>Conogethes punctiferalis</i>) | : Susceptible |
| 12.5 Rhizome scales (<i>Aspidiella hartii</i>) | : Susceptible |

13. SPECIAL CHARACTERISTICS : Fingers slender, cylindrical with prominent nodes and reddish brown scales. Performs well in irrigated, rainfed as well as late sown conditions.

14. SPECIFIC RECOMMENDATIONS : Use only disease free clonal planting material. Recommended package of practices of OUAT are to be followed.

01. CROP : GINGER
 02. VARIETY : Suravi
 03. YEAR OF RELEASE : Proposed for release in 1991
 04. INSTITUTE : High Altitude Research Station, Orissa Univ. of Agriculture and Technology, Pottangi - 764 039, Orissa.
 05. PEDIGREE : Induced mutant (V_1K_1-3) from Rudrapur local



Fig.16 Field view of Suravi

06. AREAS OF ADOPTION : Throughout ginger growing areas in Orissa
 07. MATURITY : 225 days
 08. AVERAGE YIELD : 17.5 tonnes of fresh rhizomes/ha
 09. POTENTIAL YIELD : 21.6 tonnes of fresh rhizomes/ha
 10. QUALITY ATTRIBUTES : Oleoresin: 10.2% Essential oil: 2.1%

11. MORPHOLOGICAL CHARACTERS:

- | | | | |
|-------------------------------|--------------|---|---------------|
| 11.1 Colour of aerial shoot | : Deep green | 11.6 Colour of rhizome core | : Deep yellow |
| 11.2 Plant height (cm) | : 62.0 | 11.7 Weight of fresh rhizomes per clump (g) | : 220 |
| 11.3 Leaf length/breadth (cm) | : 15.3/1.6 | 11.8 Dry recovery (%) | : 23.0 |
| 11.4 No. of tillers per clump | : 14.5 | 11.9 Crude fibre (%) | : 4.0 |
| 11.5 No. of leaves per tiller | : 14.3 | | |

12. REACTION TO MAJOR PESTS AND DISEASES:

- | | |
|---|---------------|
| 12.1 Rhizome rot (<i>Pythium aphanidermatum</i>) | : Susceptible |
| 12.2 Bacterial wilt (<i>Pseudomonas solanacearum</i>) | : Susceptible |
| 12.3 Leaf spot (<i>Phyllosticta zingiberi</i>) | : Susceptible |
| 12.4 Shoot borer (<i>Conogethes punctiferalis</i>) | : Susceptible |
| 12.5 Rhizome scale (<i>Aspidiella hartii</i>) | : Susceptible |

13. SPECIAL CHARACTERISTICS : Plumpy, cylindrical rhizomes with dark glazy skin and deep brown scales. Can be grown both under irrigated and rainfed conditions.

14. SPECIFIC RECOMMENDATIONS : Use only disease free clonal planting material. Recommended package of practices of OUAT are to be followed.

TURMERIC

Turmeric of commerce is the dried underground rhizomes of *Curcuma domestica* Val. (Syn. *C. longa* L.) belonging to the family Zingiberaceae. Another species *C. aromatica* Salisb. with typical aromatic smell and light coloured rhizomes is also cultivated to a certain extent in parts of Andhra Pradesh and Tamil Nadu and is used mainly for medicinal and cosmetic purposes. Turmeric is an erect perennial herb but is grown as an annual. It is native to Indo-Malayan region. In India, turmeric is cultivated in over 1,07,000 hectares in the states of Andhra Pradesh, Tamil Nadu, Kerala, Maharashtra, Orissa, West Bengal and North Eastern States. Turmeric requires hot and humid climate and can be cultivated in most of the tropics and subtropics provided rainfall is adequate or irrigation facilities are available. An annual rainfall of 100-200 cm is ideal. It can be grown from sea level to 1220 m above MSL at the temperature range of 15°-35°C. Turmeric thrives best on loamy, alluvial, loose and fertile soils and cannot stand water logging.

Turmeric is planted with the onset of south-west monsoon either in beds of 1-1.5 m width, 15 cm height and of convenient length or by forming ridges and furrows. It is grown as a rainfed crop in Kerala, North Eastern States while in states like Tamil Nadu and Andhra Pradesh it is mostly irrigated. Rhizome bits (20g each) are used as planting material (at the rate of 2.5 t/ha). A spacing of 45-60 cm between rows and 25 cm between plants is recommended. Compost at the rate of 40 t/ha along with 12-15 t/ha of green mulch is essential. Under rainfed conditions, fertilizer dose of 30:30:60 kg of NPK per hectare is recommended in 3 split doses while in irrigated conditions the fertilizer requirement is 60:30:90 kg of NPK in 3 split doses. The crop is harvested in Jan-March.

Rhizome rot caused by *Pythium graminicolum*, leaf blotch caused by *Taphrina maculans*, rhizome scale (*Aspidiella hartii*) and shoot borer (*Conogethes punctiferalis*) are the major diseases and pests affecting turmeric production. Spraying malathion 0.1% at monthly intervals during July-October controls the shoot borer. Leaf blotch could be minimised by spraying plants with 0.2% dithane M-45. Treatment of the seed rhizomes with 0.3% dithane M-45 and 0.1% quinalphos prior to storage and again at the time of sowing minimises both rhizome rot as well as rhizome scales.

01. CROP : TURMERIC
 02. VARIETY : Co-1
 03. YEAR OF RELEASE : 1982
 04. INSTITUTE : Dept. of Spices & Plantations Crops, Faculty of Horticulture, TNAU, Coimbatore - 641 003, Tamil Nadu.

05. PEDIGREE : Vegetative mutant (5307-1-1) by X-ray irradiation of Erode local

06. AREAS OF ADOPTION : Tamil Nadu

07. CROP DURATION : 285 days

08. AVERAGE YIELD : 30 tonnes of fresh rhizomes/ha

09. POTENTIAL YIELD : 35 tonnes of fresh rhizomes/ha

10. QUALITY ATTRIBUTES : Curcumin: 3.2% Oleoresin: 6.7% Essential oil: 3.2%

11. MORPHOLOGICAL CHARACTERS:

11.1 Colour of aerial shoot	: Green	11.8 Weight of mother rhizomes(g)	: 56.7
11.2 Plant height (cm)	: 50.8	11.9 No. of primaries	: 8.8
11.3 Leaf length/breadth (cm)	: 36.7/10.3	11.10 Weight of primaries (g)	: 180.3
11.4 No. of tillers per clump	: 4.4	11.11 No. of secondaries	: 19.4
11.5 No. of leaves per clump	: 28	11.12 Weight of secondaries (g)	: 138
11.6 Yield of rhizomes per clump (g)	: 537	11.13 Colour of rhizomes	: Orange yellow
11.7 No. of mother rhizomes	: 2	11.14 Dry recovery (%)	: 19.5

12. REACTION TO MAJOR PESTS AND DISEASES:

12.1 Rhizome rot (<i>Pythium graminicolum</i>)	: Susceptible
12.2 Leaf blotch (<i>Taphrina maculans</i>)	: Susceptible
12.3 Leaf spot (<i>Colletotrichum capsici</i>)	: Susceptible
12.4 Rhizome scales (<i>Aspidiella hartii</i>)	: Susceptible
12.5 Shoot borer (<i>Conogethes punctiferalis</i>)	: Susceptible

13. SPECIAL CHARACTERISTICS : Rhizomes big and orange yellow in colour. Suitable to drought prone, water logged and hilly areas as well as saline and alkaline areas.

14. SPECIFIC RECOMMENDATIONS : Recommended package of practices of TNAU are to be followed.



Fig.17 - Rhizomes of Co-1

01. CROP : TURMERIC
 02. VARIETY : Krishna
 03. YEAR OF RELEASE : 1983
 04. INSTITUTE : Maharashtra
 Agricultural Univ.,
 Kasba Digraj - 416 305
 Maharashtra.
 05. PEDIGREE : Clonal selection from
 Tekurpeta collection
 from Andhra Pradesh
 06. AREAS OF
 ADOPTION : Maharashtra
 07. CROP DURATION : 240 days
 08. AVERAGE YIELD : 9.2 tonnes of fresh
 rhizomes/ha



Fig.18 Rhizomes of Krishna

09. POTENTIAL YIELD : 11.8 tonnes of fresh rhizomes/ha
 10. QUALITY
 ATTRIBUTES : Curcumin: 2.8% Oleoresin: 3.8% Essential oil: 2.0%

11. MORPHOLOGICAL CHARACTERS:

- | | | | | | |
|------|------------------------------------|-------------------|-------|-------------------------------|-------------------|
| 11.1 | Colour of aerial shoot | : Yellowish green | 11.8 | Weight of mother rhizomes (g) | : 70 |
| 11.2 | Plant height (cm) | : 118 | 11.9 | No. of primaries | : 6 |
| 11.3 | Leaf length/breadth (cm) | : 50/16 | 11.10 | Weight of primaries (g) | : 300 |
| 11.4 | No. of tillers per clump | : 1.8 | 11.11 | No. of secondaries | : 7 |
| 11.5 | No. of leaves per clump | : 14.4 | 11.12 | Weight of secondaries (g) | : 175 |
| 11.6 | Yield of rhizomes per
clump (g) | : 450 | 11.13 | Colour of rhizomes | : Light
yellow |
| 11.7 | No. of mother rhizomes | : 1 | 11.14 | Dry recovery (%) | : 16.4 |

12. REACTION TO MAJOR PESTS AND DISEASES:

- | | | |
|------|---|------------------------|
| 12.1 | Rhizome rot (<i>Pythium graminicolum</i>) | : Moderately resistant |
| 12.2 | Leaf blotch (<i>Taphrina maculans</i>) | : Moderately resistant |
| 12.3 | Leaf spot (<i>Colletotrichum capsici</i>) | : Moderately resistant |
| 12.4 | Rhizome scales (<i>Aspidiella hartii</i>) | : - |
| 12.5 | Shoot borer (<i>Conogethes punctiferalis</i>) | : Moderately resistant |

13. SPECIAL CHARACTERISTICS : Long plumpy fingers with light yellow rhizomes. Moderately resistant to rhizome-fly.

14. SPECIFIC RECOMMENDATIONS : Package of practices recommended by Maharashtra Agricultural University are to be followed.

- 01. CROP : TURMERIC
- 02. VARIETY : Sugandham
- 03. YEAR OF RELEASE : 1984
- 04. INSTITUTE : Spices Research Station,
Gujarat Agricultural
University,
Jagudan - 382 701,
Gujarat.
- 05. PEDIGREE : A clonal selection from
germplasm
- 06. AREAS OF
ADOPTION : Gujarat
- 07. CROP DURATION : 210 days
- 08. AVERAGE YIELD : 15 tonnes of fresh
rhizomes/ha
- 09. POTENTIAL YIELD : 20 tonnes of fresh rhizomes/ha
- 10. QUALITY
ATTRIBUTES : Curcumin: 3.1% Oleoresin: 11% Essential oil: 2.7%



Fig. 19 Rhizomes of Sugandham

11. MORPHOLOGICAL CHARACTERS:

- | | | | |
|---|---------------|------------------------------------|---------------------|
| 11.1 Colour of aerial shoot | : Light green | 11.8 Weight of mother rhizomes (g) | : 22 |
| 11.2 Plant height (cm) | : 85 | 11.9 No. of primaries | : 12 |
| 11.3 Leaf length/breadth (cm) | : 47/15 | 11.10 Weight of primaries (g) | : 130 |
| 11.4 No. of tillers per clump | : 2 | 11.11 No. of secondaries | : 16 |
| 11.5 No. of leaves per clump | : 7 | 11.12 Weight of secondaries (g) | : 88 |
| 11.6 Yield of rhizomes
per clump (g) | : 220 | 11.13 Colour of rhizomes | : Reddish
yellow |
| 11.7 No. of mother rhizomes | : 2 | 11.14 Dry recovery (%) | : 23.3 |

12. REACTION TO MAJOR PESTS AND DISEASES:

- | | |
|---|-----------------------|
| 12.1 Rhizome rot (<i>Pythium graminicolum</i>) | : Moderately tolerant |
| 12.2 Leaf blotch (<i>Taphrina maculans</i>) | : Moderately tolerant |
| 12.3 Leaf spot (<i>Colletotrichum capsici</i>) | : Moderately tolerant |
| 12.4 Rhizome scales (<i>Aspidiella hartii</i>) | : Moderately tolerant |
| 12.5 Shoot borer (<i>Conogethes puctiferalis</i>) | : - |

13. SPECIAL CHARACTERISTICS : Thick and stout rhizomes with long internodes.

14. SPECIFIC RECOMMENDATIONS : The recommended package of practices of GAU are to be followed.

01. CROP : TURMERIC
 02. VARIETY : BSR-1
 03. YEAR OF RELEASE : 1986
 04. INSTITUTE : Dept. of Spices & Plantation Crops, Faculty of Horticulture, TNAU, Coimbatore - 641 003, Tamil Nadu.
 05. PEDIGREE : Selection (5378-3-1) from Erode Local irradiated with X-ray
 06. AREAS OF ADOPTION : Tamil Nadu



Fig.20 Rhizomes of BSR-1

07. CROP DURATION : 285 days
 08. AVERAGE YIELD : 30.7 tonnes of fresh rhizomes/ha
 09. POTENTIAL YIELD : 39.6 tonnes of fresh rhizomes/ha
 10. QUALITY ATTRIBUTES : Curcumin: 4.2% Olcoresin: 4.0% Essential oil: 3.7%

11. MORPHOLOGICAL CHARACTERS:

- | | | | |
|--------------------------------------|-------------|------------------------------------|-----------------|
| 11.1 Colour of aerial shoot | : Green | 11.8 Weight of mother rhizomes (g) | : 185 |
| 11.2 Plant height (cm) | : 73.8 | 11.9 No. of primaries | : 9.1 |
| 11.3 Leaf length/breadth (cm) | : 38.8/11.7 | 11.10 Weight of primaries (g) | : 455 |
| 11.4 No. of tillers per clump | : 3.9 | 11.11 No. of secondaries | : 21.2 |
| 11.5 No. of leaves per clump | : 15.6 | 11.12 Weight of secondaries (g) | : 170 |
| 11.6 Yield of rhizomes per clump (g) | : 805 | 11.13 Colour of rhizomes | : Bright yellow |
| 11.7 No. of mother rhizomes | : 2.7 | 11.14 Dry recovery (%) | : 20.5 |

12. REACTION TO MAJOR PESTS AND DISEASES :

- | | |
|--|---------------|
| 12.1 Rhizome rot (<i>Pythium graminicolum</i>) | : Susceptible |
| 12.2 Leaf blotch (<i>Taphrina maculans</i>) | : Susceptible |
| 12.3 Leaf spot (<i>Colletotrichum capsici</i>) | : Susceptible |
| 12.4 Rhizome scales (<i>Aspidiella hartii</i>) | : Susceptible |
| 12.5 Shoot borer (<i>Conogethes punctiferalis</i>) | : Susceptible |

13. SPECIAL CHARACTERISTICS

: Rhizomes bright yellow in colour with short internodes. Suitable to drought prone, water logged and hilly areas as well as saline and alkaline areas.

14. SPECIFIC RECOMMENDATIONS

: Recommended package of practices of TNAU are to be followed.

01. CROP : TURMERIC
02. VARIETY : Suvarna
03. YEAR OF RELEASE : 1987
04. INSTITUTE : National Research Centre for Spices (ICAR), Calicut - 673 012, Kerala.
05. PEDIGREE : A selection from the germplasm (PCT-8) collected from Assam
06. AREAS OF ADOPTION : Kerala, Karnataka & Andhra Pradesh
07. CROP DURATION : 200 days
08. AVERAGE YIELD : 17.4 tonnes of fresh rhizomes/ha
09. POTENTIAL YIELD : 43.5 tonnes of fresh rhizomes/ha
10. QUALITY ATTRIBUTES : Curcumin: 4.0%* Oleoresin: 13.5% Essential oil: 7.0%



Fig.21 Rhizomes of Suvarna

11. MORPHOLOGICAL CHARACTERS:

- | | | | |
|--------------------------------------|-------------|------------------------------------|---------------|
| 11.1 Colour of aerial shoot | : Green | 11.8 Weight of mother rhizomes (g) | : 34 |
| 11.2 Plant height (cm) | : 69.4 | 11.9 No. of primaries | : 21 |
| 11.3 Leaf length/breadth (cm) | : 66.4/17.4 | 11.10 Weight of primaries (g) | : 232 |
| 11.4 No. of tillers per clump | : 2.6 | 11.11 No. of secondaries | : 28.2 |
| 11.5 No. of leaves per clump | : 16.4 | 11.12 Weight of secondaries (g) | : 201 |
| 11.6 Yield of rhizomes per clump (g) | : 460 | 11.13 Colour of rhizomes | : Deep orange |
| 11.7 No. of mother rhizomes | : 3.0 | 11.14 Dry recovery (%) | : 26* |

12. REACTION TO MAJOR PESTS AND DISEASES:

- | | |
|--|------------------|
| 12.1 Rhizome rot (<i>Pythium graminicolum</i>) | : Field tolerant |
| 12.2 Leaf blotch (<i>Taphrina maculans</i>) | : Field tolerant |
| 12.3 Leaf spot (<i>Colletotrichum capsici</i>) | : Field tolerant |
| 12.4 Rhizome scale (<i>Aspidiella hartii</i>) | : Field tolerant |
| 12.5 Shoot borer (<i>Conogethes punctiferalis</i>) | : Field tolerant |

13. SPECIAL CHARACTERISTICS : A high yielding, short duration turmeric with deep orange coloured rhizome.

14. SPECIFIC RECOMMENDATIONS : Recommended package of practices of NRCS/SAUs are to be followed.

* Provisional

01. CROP : TURMERIC
 02. VARIETY : Roma
 03. YEAR OF RELEASE : 1988
 04. INSTITUTE : High Altitude
 Research Station,
 Orissa Univ. of Agri. &
 Technology,
 Pottangi - 764 039,
 Orissa.
 05. PEDIGREE : A clonal selection from
 T. Sunder (PTS-10)
 06. AREAS OF
 ADOPTION : In the states of Orissa,
 Tamil Nadu, Himachal
 Pradesh, Andhra
 Pradesh and Kerala.



Fig.22 Rhizomes of Roma

07. CROP DURATION : 250 days
 08. AVERAGE YIELD : 20.7 tonnes of fresh rhizomes/ha
 09. POTENTIAL YIELD : 40 tonnes of fresh rhizomes/ha
 10. QUALITY : Curcumin: 9.3%* Oleoresin: 13.2% Essential oil: 4.2%
 ATTRIBUTES

11. MORPHOLOGICAL CHARACTERS:

- | | | | |
|---|-------------|------------------------------------|--------------------|
| 11.1 Colour of aerial shoot | : Green | 11.8 Weight of mother rhizomes (g) | : 26.3 |
| 11.2 Plant height (cm) | : 74.2 | 11.9 No. of primaries | : 15 |
| 11.3 Leaf length/breadth (cm) | : 38.5/12.8 | 11.10 Weight of primaries (g) | : 147.3 |
| 11.4 No. of tillers per clump | : 3.4 | 11.11 No. of secondaries | : 22 |
| 11.5 No. of leaves per clump | : 25.5 | 11.12 Weight of secondaries (g) | : 86.4 |
| 11.6 Yield of rhizomes
per clump (g) | : 260 | 11.13 Colour of rhizomes | : Orange
yellow |
| 11.7 No. of mother rhizomes | : 2.8 | 11.14 Dry recovery (%) | : 31 |

12. REACTION TO MAJOR PESTS AND DISEASES:

- | | |
|--|---------------|
| 12.1 Rhizome rot (<i>Pythium graminicolum</i>) | : - |
| 12.2 Leaf blotch (<i>Taphrina maculans</i>) | : Tolerant |
| 12.3 Leaf spot (<i>Colletotrichum capsici</i>) | : Tolerant |
| 12.4 Rhizome scales (<i>Aspidiella hartii</i>) | : Tolerant |
| 12.5 Shoot borer (<i>Conogethes punctiferalis</i>) | : Susceptible |

13. SPECIAL CHARACTERISTICS : Performs well under late sown conditions. Suitable for both irrigated and rainfed conditions. Ideally suited for hilly areas.

14. SPECIFIC RECOMMENDATIONS : Recommended package of practices of OUAT are to be followed.

* Provisional

01. CROP : TURMERIC
02. VARIETY : Suroma
03. YEAR OF RELEASE : 1989
04. INSTITUTE : High Altitude Research Station, Orissa Univ. of Agri. & Technology, Pottangi - 764 039, Orissa.
05. PEDIGREE : A clonal selection from T. Sunder (PTS-24)
06. AREAS OF ADOPTION : In the States of Orissa, Tamil Nadu and Himachal Pradesh.



Fig.23 Rhizomes of Suroma

07. CROP DURATION : 253 days
08. AVERAGE YIELD : 20 tonnes of fresh rhizomes/ha.
09. POTENTIAL YIELD : 44.9 tonnes of fresh rhizomes/ha.
10. QUALITY ATTRIBUTES : Curcumin: 9.3%* Oleoresin: 13.1% Essential oil: 4.4%

11. MORPHOLOGICAL CHARACTERS :

- | | | | |
|--------------------------------------|-------------|------------------------------------|-----------------------|
| 11.1 Colour of aerial shoot | : Green | 11.8 Weight of mother rhizomes (g) | : 23.0 |
| 11.2 Plant height (cm) | : 76.5 | 11.9 No. of primaries | : 16.0 |
| 11.3 Leaf length/breadth (cm) | : 40.4/13.7 | 11.10 Weight of primaries (g) | : 143.6 |
| 11.4 No. of tillers per clump | : 2.6 | 11.11 No. of secondaries | : 30.0 |
| 11.5 No. of leaves per clump | : 18.2 | 11.12 Weight of secondaries (g) | : 95.4 |
| 11.6 Yield of rhizomes per clump (g) | : 262 | 11.13 Colour of rhizomes | : Light orange yellow |
| 11.7 No. of mother rhizomes | : 2.7 | 11.14 Dry recovery (%) | : 26 |

12. REACTION TO MAJOR PESTS AND DISEASES :

- | | |
|--|------------|
| 12.1 Leaf rot (<i>Pythium graminicolum</i>) | : - |
| 12.2 Leaf blotch (<i>Taphrina maculans</i>) | : Tolerant |
| 12.3 Leaf spot (<i>Colletotrichum capsici</i>) | : Tolerant |
| 12.4 Rhizome scales (<i>Aspidiella hartii</i>) | : Tolerant |
| 12.5 Shoot borer (<i>Conogethes punctiferalis</i>) | : - |

13. SPECIAL CHARACTERISTICS : A variety with high curcumin, round and plumpy mother rhizomes and slender fingers with dark brown scales, light orange yellow flesh and reddish brown skin.

14. SPECIFIC RECOMMENDATIONS : Recommended package of practices of OUAT are to be followed.

* Provisional

01. CROP : TURMERIC
 02. VARIETY : Rajendra Sonia
 03. YEAR OF RELEASE : 1989
 04. INSTITUTE : Department of Horticulture, Tirhut College of Agriculture, Rajendra Agricultural University, Dholi - 843 121, Bihar.
 05. PEDIGREE : Selection (RH-10) from the germplasm collection from Balmikinagar, Bihar.



Fig.24 Mature clumps of Sonia with rhizomes

06. AREAS OF ADOPTION : North Bihar
 07. CROP DURATION : 225 days
 08. AVERAGE YIELD : 4.8 tonnes of fresh rhizomes/ha.
 09. POTENTIAL YIELD : -
 10. QUALITY ATTRIBUTES : Curcumin: 8.4% Oleoresin: - Essential oil: 5.0%

11. MORPHOLOGICAL CHARACTERS :

- | | | | |
|--------------------------------------|---------|------------------------------------|---------------|
| 11.1 Colour of aerial shoot | : Green | 11.8 Weight of mother rhizomes (g) | : 30 |
| 11.2 Plant height (cm) | : 87.5 | 11.9 No. of primaries | : 11 |
| 11.3 Leaf length/breadth (cm) | : 48/16 | 11.10 Weight of primaries (g) | : 400 |
| 11.4 No. of tillers per clump | : 3.5 | 11.11 No. of secondaries | : 10 |
| 11.5 No. of leaves per clump | : 33 | 11.12 Weight of secondaries (g) | : 158 |
| 11.6 Yield of rhizomes per clump (g) | : 325 | 11.13 Colour of rhizomes | : Deep orange |
| 11.7 No. of mother rhizomes | : 3.5 | 11.14 Dry recovery (%) | : 18 |

12. REACTION TO MAJOR PESTS AND DISEASES:

- | | |
|--|------------------------|
| 12.1 Leaf rot (<i>Pythium graminicolum</i>) | : Moderately resistant |
| 12.2 Leaf blotch (<i>Taphrina maculans</i>) | : Resistant |
| 12.3 Leaf spot (<i>Colletotrichum capsici</i>) | : Susceptible |
| 12.4 Rhizome scales (<i>Aspidiella hartii</i>) | : Resistant |
| 12.5 Shoot borer (<i>Conogethes punctiferalis</i>) | : Resistant |

13. SPECIAL CHARACTERISTICS : A variety with stout and plumpy rhizomes and high curcumin content.

14. SPECIFIC RECOMMENDATIONS : The recommended package of practices of Tirhut College of Agriculture, RAU are to be followed.

01. CROP : TURMERIC
 02. VARIETY : Suguna
 03. YEAR OF RELEASE : 1991
 04. INSTITUTE : National Research Centre for Spices (ICAR), Calicut - 673 012, Kerala.
 05. PEDIGREE : A selection from the germplasm (PCT-13) collected from Andhra Pradesh
 06. AREAS OF ADOPTION : Kerala & Andhra Pradesh
 07. CROP DURATION : 190 days
 08. AVERAGE YIELD : 29.3 tonnes of fresh rhizomes/ha
 09. POTENTIAL YIELD : 60.3 tonnes of fresh rhizomes/ha
 10. QUALITY ATTRIBUTES : Curcumin: 4.9%* Oleoresin: 13.5% Essential oil: 6.0%



Fig. 25 Rhizomes of Suguna

11. MORPHOLOGICAL CHARACTERS:

- | | | | |
|--------------------------------------|-----------|------------------------------------|----------|
| 11.1 Colour of aerial shoot | : Green | 11.8 Weight of mother rhizomes (g) | : 15 |
| 11.2 Plant height (cm) | : 107 | 11.9 No. of primaries | : 9.3 |
| 11.3 Leaf length/breadth (cm) | : 46/12.3 | 11.10 Weight of primaries (g) | : 210 |
| 11.4 No. of tillers per clump | : 1.9 | 11.11 No. of secondaries | : 26.4 |
| 11.5 No. of leaves per clump | : 12.8 | 11.12 Weight of secondaries (g) | : 337 |
| 11.6 Yield of rhizomes per clump (g) | : 529 | 11.13 Colour of rhizomes | : Orange |
| 11.7 No. of mother rhizomes | : 1.8 | 11.14 Dry recovery (%) | : 20.4* |

12. REACTION TO MAJOR PESTS AND DISEASES:

- | | |
|--|-----------------------|
| 12.1 Rhizome rot (<i>Pythium graminicolum</i>) | : Moderately tolerant |
| 12.2 Leaf blotch (<i>Taphrina maculans</i>) | : Moderately tolerant |
| 12.3 Leaf spot (<i>Colletotrichum capsici</i>) | : Susceptible |
| 12.4 Rhizome scale (<i>Aspidiella hartii</i>) | : susceptible |
| 12.5 Shoot borer (<i>Conogethes punctiferalis</i>) | : Susceptible |

13. SPECIAL CHARACTERISTICS : A short duration variety with thick & plumpy rhizomes and high yield potential. Field tolerant to rhizome rot.

14. SPECIFIC RECOMMENDATIONS : Recommended package of practices of NRCS/SAUs are to be followed.

* Provisional

01. CROP : TURMERIC
 02. VARIETY : Sudarshana
 03. YEAR OF RELEASE : 1991
 04. INSTITUTE : National Research Centre for Spices (ICAR), Calicut - 673 012, Kerala.
 05. PEDIGREE : A selection from germplasm (PCT-14) collected from Singhat, Manipur
 06. AREAS OF ADOPTION : Kerala & Andhra Pradesh



Fig.26 Rhizomes of Sudarshana

07. CROP DURATION : 190 days
 08. AVERAGE YIELD : 28.8 tonnes of fresh rhizomes/ha
 09. POTENTIAL YIELD : 54.9 tonnes of fresh rhizomes/ha
 10. QUALITY ATTRIBUTES : Curcumin: 7.9%* Oleoresin: 15.0% Essential oil: 7.0%

11. MORPHOLOGICAL CHARACTERS:

- | | | | |
|--------------------------------------|-------------|------------------------------------|----------|
| 11.1 Colour of aerial shoot | : Green | 11.8 Weight of mother rhizomes (g) | : 17 |
| 11.2 Plant height (cm) | : 136 | 11.9 No. of primaries | : 10.1 |
| 11.3 Leaf length/breadth (cm) | : 37.4/12.1 | 11.10 Weight of primaries (g) | : 236 |
| 11.4 No. of tillers per clump | : 1.9 | 11.11 No. of secondaries (g) | : 20.1 |
| 11.5 No. of leaves per clump | : 14.3 | 11.12 Weight of secondaries (g) | : 310 |
| 11.6 Yield of rhizomes per clump (g) | : 565 | 11.13 Colour of rhizomes | : Orange |
| 11.7 No. of mother rhizomes | : 1.8 | 11.14 Dry recovery (%) | : 20.6* |

12. REACTION TO MAJOR PESTS AND DISEASES:

- | | |
|--|-----------------------|
| 12.1 Rhizome rot (<i>Pythium graminicolum</i>) | : Moderately tolerant |
| 12.2 Leaf blotch (<i>Taphrina maculans</i>) | : Moderately tolerant |
| 12.3 Leaf spot (<i>Colletotrichum capsici</i>) | : Susceptible |
| 12.4 Rhizome scales (<i>Aspidiella hartii</i>) | : Susceptible |
| 12.5 Shoot borer (<i>Conogethes punctiferalis</i>) | : Susceptible |

13. SPECIAL CHARACTERISTICS

: A high yielding high quality short duration turmeric with thick plumpy rhizomes. Field tolerant to rhizome rot.

14. SPECIFIC RECOMMENDATIONS

: Recommended package of practices of NRCS/SAUs are to be followed.

* Provisional

01. CROP : TURMERIC
02. VARIETY : Ranga
03. YEAR OF RELEASE : Proposed for release in 1992
04. INSTITUTE : High Altitude Research Station, Orissa Univ. of Agriculture & Technology, Pottangi - 764 039, Orissa.
05. PEDIGREE : A clonal selection from Rajpuri local (PTS-38)
06. AREAS OF ADOPTION : In the states of Orissa, Tamil Nadu, Andhra Pradesh & Kerala
07. CROP DURATION : 250 days
08. AVERAGE YIELD : 29 tonnes of fresh rhizomes/ha
09. POTENTIAL YIELD : 37.1 tonnes of fresh rhizomes/ha
10. QUALITY ATTRIBUTES : Curcumin: 6.3% Oleoresin: 13.5% Essential oil: 4.4%



Fig.27 Rhizomes of Ranga

11. MORPHOLOGICAL CHARACTERS:

- | | | | | | |
|------|---------------------------------|--------------|-------|-------------------------------|-----------------|
| 11.1 | Colour of aerial shoot | : Deep green | 11.8 | Weight of mother rhizomes (g) | : 80.0 |
| 11.2 | Plant height (cm) | : 100.0 | 11.9 | No. of primaries | : 16.0 |
| 11.3 | Leaf length/breadth (cm) | : 49.0/15.3 | 11.10 | Weight of primaries (g) | : 150.0 |
| 11.4 | No. of tillers per clump | : 2.3 | 11.11 | No. of secondaries | : 32.0 |
| 11.5 | No. of leaves per clump | : 8.0 | 11.12 | Weight of secondaries (g) | : 50.0 |
| 11.6 | Yield of rhizomes per clump (g) | : 280 | 11.13 | Colour of rhizomes | : Orange yellow |
| 11.7 | No. of mother rhizomes | : 2.3 | 11.14 | Dry recovery (%) | : 24.8 |

12. REACTION TO MAJOR PESTS AND DISEASES:

- | | | |
|------|--|------------------------|
| 12.1 | Rhizome rot (<i>Pythium graminicolum</i>) | : - |
| 12.2 | Leaf blotch (<i>Taphrina maculans</i>) | : Moderately resistant |
| 12.3 | Leaf spot (<i>Colletotrichum capsici</i>) | : - |
| 12.4 | Rhizome scales (<i>Aspidiella hartii</i>) | : Moderately resistant |
| 12.5 | Shoot borer (<i>Congethes punctiferalis</i>) | : - |

13. SPECIAL CHARACTERISTICS : Mother rhizomes are bold and spindle shaped. Suitable for late shown condition and gives good yield under low lying areas.
14. SPECIFIC RECOMMENDATIONS : Recommended package of practices of OUAT are to be followed.

01. CROP : TURMERIC
02. VARIETY : Rasmi
03. YEAR OF RELEASE : Proposed for release in 1992
04. INSTITUTE : High Altitude Research Station, Orissa Univ. of Agriculture & Technology, Pottangi - 764 039, Orissa.
05. PEDIGREE : A clonal selection from Rajpuri local (PTS-9)
06. AREAS OF ADOPTION : Orissa, Tamil Nadu, Andhra Pradesh & Kerala
07. CROP DURATION : 240 days
08. AVERAGE YIELD : 31.3 tonnes of fresh rhizomes/ha
09. POTENTIAL YIELD : 37.5 tonnes of fresh rhizomes/ha
10. QUALITY ATTRIBUTES : Curcumin: 6.4% Oleoresin: 13.4% Essential oil: 4.4%



Fig.28 Rhizomes of Rasmi

11. MORPHOLOGICAL CHARACTERS:

- | | | | |
|--------------------------------------|-------------|------------------------------------|-----------------|
| 11.1 Colour of aerial shoot | : Green | 11.8 Weight of mother rhizomes (g) | : 82.0 |
| 11.2 Plant height (cm) | : 109.0 | 11.9 No. of primaries | : 14.0 |
| 11.3 Leaf length/breadth (cm) | : 64.7/15.6 | 11.10 Weight of primaries (g) | : 151.0 |
| 11.4 No. of tillers per clump | : 2.1 | 11.11 No. of secondaries | : 32.0 |
| 11.5 No. of leaves per clump | : 7.0 | 11.12 Weight of secondaries (g) | : 50.0 |
| 11.6 Yield of rhizomes per clump (g) | : 283 | 11.13 Colour of rhizomes | : Bright yellow |
| 11.7 No. of mother rhizomes | : 2.1 | 11.14 Dry recovery (%) | : 23.0 |

12. REACTION TO MAJOR PESTS AND DISEASES:

- | | |
|---|------------------------|
| 12.1 Rhizome rot (<i>Pythium graminicolum</i>) | : - |
| 12.2 Leaf blotch (<i>Taphrina maculans</i>) | : - |
| 12.3 Leaf spot (<i>Colletotrichum capsici</i>) | : Moderately resistant |
| 12.4 Rhizome scales (<i>Aspidiella hartii</i>) | : Moderately resistant |
| 12.5 Shoot borer (<i>Congethes punctiferalis</i>) | : - |

13. SPECIAL CHARACTERISTICS : Mother rhizomes are round shaped having plumpy primary fingers. Grows successfully both as irrigated and rainfed crop in early and late sown conditions. Gives satisfactory yield under dry land conditions.
14. SPECIFIC RECOMMENDATIONS : Recommended package of practices of OUAT are to be followed.

CORIANDER

Coriander is the dried fruit of *Coriandrum sativum* L., an annual herb of the family Apiaceae. Native to the Eastern Mediterranean region, coriander is extensively grown in India both for its leaves as well as fruits. Coriander is cultivated in the states of Gujarat, Rajasthan, Andhra Pradesh, Madhya Pradesh, Bihar, Tamil Nadu etc., and approximately 3,40,000 hectares of area is under cultivation with a production around 1,40,000 tonnes. The other major coriander producing regions are USSR, Central Europe, Morocco and Asia Minor.

Coriander is an erect, corymbosely branched, glabrous, annual herb, 20-90 cm in height. The leaves are pinnate with cernate margins. The inflorescence is a compound umbel and the yellowish brown fruits are almost round 3-4 mm in diameter with ribs. The fruit is a schyzocarp and consists of two mericarps.

Coriander grows in a wide range of climatic and soil conditions. It thrives best in medium to heavy black cotton soils with good drainage and well distributed moisture. In states other than Andhra Pradesh, it is grown mostly as an irrigated crop in rabi season. In Tamil Nadu it is cultivated both in kharif and rabi seasons. The crop is sown at 30 x 10 cm spacing or by broadcasting with a seed rate of 10-12 kg/ha. Application of NPK at the rate of 30:40:20 kg/ha with 10-15 tonnes of farm yard manure gives better yields. The crop comes to harvest in 100 - 120 days for grains and 40 days for greens.

Major pests like white fly, aphids, mites, weevil etc., and diseases like stem gall, wilt, powdery mildew, grain mould etc. are the major productions constraints. Foliar application of 0.15% dimethoate at 10 days' interval will reduce the pest problems. Spraying 0.3% wettable sulphur or 0.1% karathane twice will control powdery mildew while spraying 0.1% carbendazim twice will reduce grain mould infestation. Crop rotation is recommended to reduce wilt and stem gall.

01. CROP : CORIANDER
 02. VARIETY : Co-1
 03. YEAR OF RELEASE : 1972
 04. INSTITUTE : Dept. of Spices & Plantation Crops, Tamil Nadu Agr. University, Coimbatore - 641 003, Tamil Nadu.
 05. PEDIGREE : Selection from Koilpatti local
 06. AREAS OF ADOPTION : Southern districts of Tamil Nadu
 07. PLANTING SEASON : June - July / Oct. - Nov.
 08. SEED RATE : 15 Kg/ha
 09. CROP DURATION : 100 - 120 days
 10. AVERAGE YIELD : 400 kg/ha
 11. POTENTIAL YIELD : 550 kg/ha
 12. QUALITY : Essential oil: 0.27%
 ATTRIBUTES

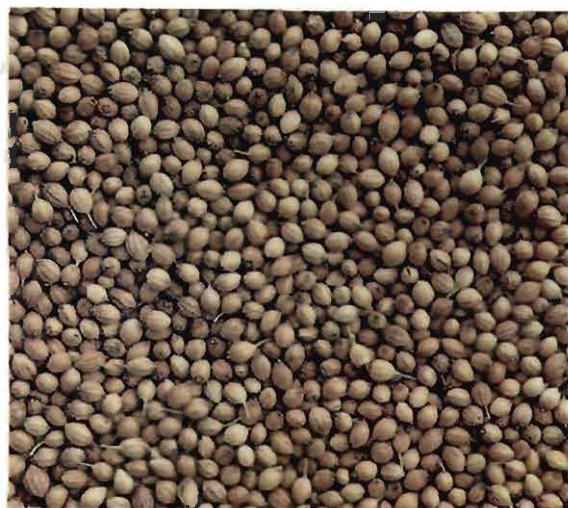


Fig.29 - Dried fruits of Co-1

13. MORPHOLOGICAL CHARACTERS:

- | | | | |
|------------------------------------|--------|-------------------------------|---------------|
| 13.1 Plant height (cm) | : 50.2 | 13.6 Shape of fruit | : Globular |
| 13.2 No. of primary branches/plant | : 7.8 | 13.7 Grain size | : Small |
| 13.3 Days taken for 50% flowering | : 85 | 13.8 Weight of 1000 seeds (g) | : 14.3 |
| 13.4 No. of umbels per plant | : 45.2 | 13.9 Colour of the grain | : Dusty brown |
| 13.5 No. of umbellates per umbel | : 4.8 | | |

14. REACTION TO MAJOR PESTS AND DISEASES:

- | | |
|---|---------------|
| 14.1 Wilt (<i>Fusarium oxysporum f.sp. corianderii</i>) | : Susceptible |
| 14.2 Powdery mildew (<i>Erysiphe polygoni</i>) | : Susceptible |
| 14.3 Stem gall (<i>Protomyces macrosporus</i>) | : Susceptible |
| 14.4 Grain mould (<i>Alternaria Sp., Curvularia Sp., HelminthosporiumSp.</i>) | : Susceptible |
| 14.5 Aphid (<i>Myzus persicae</i>) | : Susceptible |
| 14.6 Weevil (<i>Tribolium castaneum</i>) | : Susceptible |

15. SPECIAL CHARACTERISTICS : A variety with small statured plants and small grains
16. SPECIFIC RECOMMENDATIONS : Suitable for rainfed condition of southern districts of Tamil Nadu. Package of practices recommended by Tamil Nadu Agricultural University are to be followed.

- 01. CROP : CORIANDER
- 02. VARIETY : Gujarat Coriander-1
- 03. YEAR OF RELEASE : 1974
- 04. INSTITUTE : Spices Research Station, Gujarat Agr. Univ., Jagudan - 382 710, Gujarat.
- 05. PEDIGREE : Selection
- 06. AREAS OF ADOPTION : Gujarat
- 07. PLANTING SEASON : Oct-Nov
- 08. SEED RATE : 20 kg/ha by broadcasting



Fig.30 Guj. Coriander-1 in flowering

- 09. CROP DURATION : 112 days
- 10. AVERAGE YIELD : 1100 kg/ha
- 11. POTENTIAL YIELD : 1900 Kg/ha
- 12. QUALITY : Essential oil: 0.35%

13. MORPHOLOGICAL CHARACTERS:

- | | |
|--|--------------------------------------|
| 13.1 Plant height (cm) : 68 | 13.6 Shape of fruit : Round |
| 13.2 No. of primary branches/plant : 3.2 | 13.7 Grain size : Bold |
| 13.3 Days taken for 50% flowering : 47 | 13.8 Weight of 1000 seeds (g) : 13.2 |
| 13.4 No. of umbels per plant : 12 | 13.9 Colour of the grain : Yellow |
| 13.5 No. of umbellates per umbel : 5.2 | |

14. REACTION TO MAJOR PESTS AND DISEASES:

- | | |
|--|-----------------------|
| 14.1 Wilt (<i>Fusarium oxysporum f.sp. corianderii</i>) | : Moderately tolerant |
| 14.2 Powdery mildew (<i>Erysiphe polygoni</i>) | : Moderately tolerant |
| 14.3 Stem gall (<i>protomyces macrosporus</i>) | : - |
| 14.4 Grain mould (<i>Alternaria Sp., Curvularia Sp., Helminthosporium Sp.</i>) | : - |
| 14.5 Aphid (<i>Myzus persicae</i>) | : - |
| 14.6 Weevil (<i>Tribolium castaneum</i>) | : - |

- 15. SPECIAL CHARACTERISTICS : Erect plant, suitable for early sowing.
- 16. SPECIAL RECOMMENDATIONS : Package of practices recommended by Gujarat Agricultural University are to be followed.

01. CROP : CORIANDER
 02. VARIETY : Co-2
 03. YEAR OF RELEASE : 1985
 04. INSTITUTE : Dept. of Spices & Plantation Crops, Tamil Nadu Agr. University, Coimbatore - 641 003, Tamil Nadu.

05. PEDIGREE : Reselection from Cul.P₂ from Gujarat

06. AREAS OF ADOPTION : Tamil Nadu

07. PLANTING SEASON : June-July / Oct-Nov

08. SEED RATE : 10-12 kg/ha
 Sown at 22.5 x 15 cm spacing

09. CROP DURATION : 90 - 110 days (40 days for green)

10. AVERAGE YIELD : 520 kg/ha (1000 kg/ha green)

11. POTENTIAL YIELD : 790 kg/ha

12. QUALITY : Essential oil: 0.40%
 ATTRIBUTES

13. MORPHOLOGICAL CHARACTERS:

13.1 Plant height (cm) : 59.4
 13.2 No. of primary branches/plant : 8.4
 13.3 Days taken for 50% flowering : 60
 13.4 No. of umbels per plant : 63
 13.5 No. of umbellates per umbel : 6.1

13.6 Shape of fruit : Oblong
 13.7 Grain size : Medium
 13.8 Weight of 1000 seeds (g) : 15
 13.9 Colour of the grain : Dull yellowish brown

14. REACTION TO MAJOR PESTS AND DISEASES:

14.1 Wilt (*Fusarium oxysporum f.sp. corianderii*) : Susceptible
 14.2 Powdery mildew (*Erysiphe polygoni*) : Susceptible
 14.3 Stem gall (*Protomyces macrosporus*) : Susceptible
 14.4 Grain mould (*Alternaria Sp., Curvularia Sp., Helminthosporium Sp.*) : Susceptible
 14.5 Aphid (*Myzhus persicae*) : Susceptible
 14.6 Weevil (*Tribolium castaneum*) : Susceptible

15. SPECIAL CHARACTERISTICS

: It is a dual purpose variety with bigger leaves can be grown in water logged, drought, saline and alkaline conditions.

16. SPECIFIC RECOMMENDATIONS

: Package of practices of Tamil Nadu Agricultural University are to be followed.



Fig.31 Flowering plant of Co-2

01. CROP : CORIANDER
 02. VARIETY : Gujarat Coriander-2
 03. YEAR OF RELEASE : 1985
 04. INSTITUTE : Spices Research Station, Gujarat Agr. University, Jagudan - 382 710.
 05. PEDIGREE : Reselection from Co-1
 06. AREAS OF ADOPTION : Gujarat
 07. PLANTING SEASON : Oct-Nov
 08. SEED RATE : 20 kg/ha (30 x 15cm spacing)
 09. CROP DURATION : 110 days
 10. AVERAGE YIELD : 1450 kg/ha
 11. POTENTIAL YIELD : 2000 kg/ha
 12. QUALITY : Essential oil: 0.40%
 ATTRIBUTES



Fig.32 Guj. Coriander-2, plant with mature fruits

13. MORPHOLOGICAL CHARACTERS:

- | | |
|--|--|
| 13.1 Plant height (cm) : 72 | 13.6 Shape of fruit : Oblong |
| 13.2 No. of primary branches/plant : 4.5 | 13.7 Grain size : Bold |
| 13.3 Days taken for 50% flowering : 50 | 13.8 Weight of 100 seeds (g) : 14.8 |
| 13.4 No. of umbels per plant : 15 | 13.9 Colour of the grain : Brownish yellow |
| 13.5 No. of umbellates per umbel : 5.9 | |

14. REACTION TO MAJOR PESTS AND DISEASES:

- | | |
|--|-----------------------|
| 14.1 Wilt (<i>Fusarium oxysporum f.sp. corianderii</i>) | : Moderately tolerant |
| 14.2 Powdery mildew (<i>Erysiphe polygoni</i>) | : Moderately tolerant |
| 14.3 Stem gall (<i>Protomyces macrosporus</i>) | : - |
| 14.4 Grain mould (<i>Alternaria Sp., Curvularia Sp., Helminthosporium Sp.</i>) | : - |
| 14.5 Aphid (<i>Myzus persicae</i>) | : - |
| 14.6 Weevil (<i>Tribolium castaneum</i>) | : - |

15. SPECIAL CHARACTERISTICS : A variety with semi-spreading habit, dense foliage with dark green leaves. The grain is bold. There is no problem of lodging and shattering. Suitable for early sowing.

16. SPECIFIC RECOMMENDATIONS : The recommended package of practices of Gujarat Agricultural University are to be followed.

01. CROP : CORIANDER
02. VARIETY : **Rajendra Swati (RD-44)**
03. YEAR OF RELEASE : 1987
04. INSTITUTE : Dept. of Horticulture,
Tirhut College of
Agriculture,
Rajendra Agr. Univ.,
Dholi - 843 121, Bihar.
05. PEDIGREE : A selection from the
germplasm collected
from Muzaffarpur
06. AREAS OF
ADOPTION : Plains of North Bihar
07. PLANTING SEASON : October
08. SEED RATE : 12-15 kg/ha sown at
a spacing of 30 x 20 cm
09. CROP DURATION : 100 days
10. AVERAGE YIELD : 1300 kg/ha
11. POTENTIAL YIELD : 1600 kg/ha
12. QUALITY : Essential oil: 0.65%
- ATTRIBUTES



Fig.33 Flowering plants of Rajendra Swati

13. MORPHOLOGICAL CHARACTERS:

- | | |
|---|---|
| 13.1 Plant height (cm) : 85 | 13.6 Shape of fruit : Round |
| 13.2 No. of primary branches/plant : 12 | 13.7 Grain size : - |
| 13.3 Days taken for 50% flowering : 55 | 13.8 Weight of 1000 seeds (g): 1.25 |
| 13.4 No. of umbels per plant : 45 | 13.9 Colour of the grain : Straw yellow |
| 13.5 No. of umbellates per umbel : 10 | |

14. REACTION TO MAJOR PESTS AND DISEASES:

- | | |
|--|------------------------|
| 14.1 Wilt (<i>Fusarium oxysporum f.sp. corianderii</i>) | : Moderately resistant |
| 14.2 Powdery mildew (<i>Erysiphe polygoni</i>) | : Susceptible |
| 14.3 Stem gall (<i>Protomyces macrosporus</i>) | : Resistant |
| 14.4 Grain mould (<i>Alternaria Sp., Curvularia Sp., Helminthosporium Sp.</i>) | : Susceptible |
| 14.5 Aphid (<i>Myzus persicae</i>) | : Moderately resistant |
| 14.6 Weevil (<i>Tribolium castaneum</i>) | : Moderately resistant |

15. SPECIAL CHARACTERISTICS : Medium sized plant with fine and aromatic grains. Suitable for intercropping also. Tolerant to fruit fly.

16. SPECIFIC RECOMMENDATIONS : Package of practices recommended by Tirhut College of Agriculture, Rajendra Agricultural University are to be followed.

01. CROP : CORIANDER
 02. VARIETY : RCr-41
 03. YEAR OF RELEASE : 1988
 04. INSTITUTE : SKN College of Agriculture, Rajasthan Agr. University, Jobner - 303 329, Rajasthan.
 05. PEDIGREE : Recurrent selection from local 'Kota'(UD-41)
 06. AREAS OF ADOPTION : Rajasthan
 07. PLANTING SEASON : First fortnight of November
 08. SEED RATE : 10 - 12 kg/ha
 09. CROP DURATION : 140 days
 10. AVERAGE YIELD : 1200 Kg/ha
 11. POTENTIAL YIELD : 1900 Kg/ha
 12. QUALITY : Essential oil: 0.25%
 ATTRIBUTES

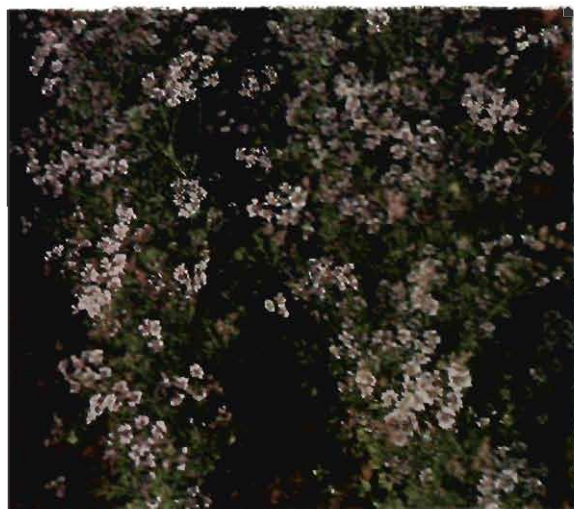


Fig.34 Plants of RCr-41 in flowering

13. MORPHOLOGICAL CHARACTERS:

- | | |
|--|--|
| 13.1 Plant height (cm) : 87.5 | 13.6 Shape of fruit : Round |
| 13.2 No. of primary branches/plant : 6.0 | 13.7 Grain size : Small |
| 13.3 Days taken for 50% flowering : 75 | 13.8 Weight of 1000 seeds (g) : 9.8 |
| 13.4 No. of umbels per plant : 45 | 13.9 Colour of the grain : Greenish yellow |
| 13.5 No. of umbellates per umbel : 4.8 | |

14. REACTION TO MAJOR PESTS AND DISEASES:

- | | |
|--|------------------------|
| 14.1 Wilt (<i>Fusarium oxysporum f.sp. corianderii</i>) | : Tolerant |
| 14.2 Powdery mildew (<i>Erysiphe polygoni</i>) | : Moderately resistant |
| 14.3 Stem gall (<i>Protomyces macrosporus</i>) | : Resistant |
| 14.4 Grain mould (<i>Alternaria Sp., Curvularia Sp., Helminthosporium Sp.</i>) | : - |
| 14.5 Aphid (<i>Myzus persicae</i>) | : - |
| 14.6 Weevil (<i>Tribolium castaneum</i>) | : - |

15. SPECIAL CHARACTERISTICS : It is a tall, erect plant type with thicker stem having light to deep violet colour. Seeds are small and round. Moderately resistant to root knot nematode.

16. SPECIFIC RECOMMENDATIONS : Irrigation required. Recommended package of practices of SKN College of Agriculture (RAJAU) are to be followed.

01. CROP : CORIANDER
 02. VARIETY : Sadhana
 03. YEAR OF RELEASE : 1989
 04. INSTITUTE : Regional Agr. Res. Station, Andhra Pradesh Agr. University, Lam, Guntur - 522 034. Andhra Pradesh.
 05. PEDIGREE : Mass selection (CS-4) from local Alur collection from Kurnool district.
 06. AREAS OF ADOPTION : Andhra Pradesh
 07. PLANTING SEASON : Oct-Nov
 08. SEED RATE : 12-15 kg/ha
 09. CROP DURATION : 100 days
 10. AVERAGE YIELD : 1025 kg/ha
 11. POTENTIAL YIELD : 1300 kg/ha
 12. QUALITY : Essential oil: 0.20%
 ATTRIBUTES



Fig.35 A mature umbel of Sadhana

13. MORPHOLOGICAL CHARACTERS:

- | | |
|--|--|
| 13.1 Plant height (cm) : 65 | 13.6 Shape of fruit : Oval |
| 13.2 No. of primary branches/plant : 9 | 13.7 Grain size : Medium |
| 13.3 Days taken for 50% flowering : 53 | 13.8 Weight of 1000 seeds (g) : 18 |
| 13.4 No. of umbels per plant : 22 | 13.9 Colour of the grain coloured : Straw coloured |
| 13.5 No. of umbellates per umbel : 7 | |

14. REACTION TO MAJOR PESTS AND DISEASES:

- | | |
|--|---------------|
| 14.1 Wilt (<i>Fusarium oxysporum f.sp. corianderii</i>) | : Tolerant |
| 14.2 Powdery mildew (<i>Erysiphe polygoni</i>) | : Tolerant |
| 14.3 Stem gall (<i>Protomyces macrosporus</i>) | : - |
| 14.4 Grain mould (<i>Alternaria Sp., Curvularia Sp., Helminthosporium Sp.</i>) | : Susceptible |
| 14.5 Aphid (<i>Myzus persicae</i>) | : Tolerant |
| 14.6 Weevil (<i>Tribolium castaneum</i>) | : Susceptible |

15. SPECIAL CHARACTERISTICS

: A semi erect, dual purpose, medium duration variety, suitable for rainfed condition. Tolerant to white fly and mites under field conditions.

16. SPECIFIC RECOMMENDATIONS

: Package of practices recommended by Andhra Pradesh Agricultural University are to be followed.

- 01. CROP : CORIANDER
- 02. VARIETY : Swathi
- 03. YEAR OF RELEASE : 1989
- 04. INSTITUTE : Regional Agr. Res. Station, Andhra Pradesh Agr. University, Lam, Guntur - 522 034, Andhra Pradesh.
- 05. PEDIGREE : Mass selection (CS-6) from the Nandyal germplasm
- 06. AREAS OF ADOPTION : Andhra Pradesh
- 07. PLANTING SEASON : Oct-Nov
- 08. SEED RATE : 12-15 kg/ha
- 09. CROP DURATION : 83 days
- 10. AVERAGE YIELD : 885 kg/ha
- 11. POTENTIAL YIELD : 1080 kg/ha
- 12. QUALITY : Essential oil: 0.30%



Fig.36 Field view of Swathi

13. MORPHOLOGICAL CHARACTERS:

- | | |
|--|---|
| 13.1 Plant height (cm) : 57 | 13.6 Shape of fruit : Oval |
| 13.2 No. of primary branches/plant : 6 | 13.7 Grain size : Medium |
| 13.3 Days taken for 50% flowering : 47 | 13.8 Weight of 1000 seeds (g) : 16 |
| 13.4 No. of umbels per plant : 15 | 13.9 Colour of the grain : Straw coloured |
| 13.5 No. of umbellates per umbel : 5 | |

14. REACTION TO MAJOR PESTS AND DISEASES:

- | | |
|--|---------------------------------|
| 14.1 Wilt (<i>Fusarium oxysporum f.sp. corianderii</i>) | : Tolerant |
| 14.2 Powdery mildew (<i>Erysiphe polygoni</i>) | : Escapes due to early maturity |
| 14.3 Stem gall (<i>Protomyces macrosporus</i>) | : - |
| 14.4 Grain mould (<i>Alternaria Sp., Curvularia Sp., Helminthosporium Sp.</i>) | : Tolerant |
| 14.5 Aphid (<i>Myzus persicae</i>) | : Tolerant |
| 14.6 Weevil (<i>Tribolium castaneum</i>) | : Susceptible |

- 15. SPECIAL CHARACTERISTICS : A semi erect, early maturing type suitable for rainfed and also late sown conditions. Tolerant to white fly.

- 16. SPECIFIC RECOMMENDATIONS : Package of practices recommended by Andhra Pradesh Agricultural University are to be followed.

01. CROP : CORIANDER
 02. VARIETY : CO-3
 03. YEAR OF RELEASE : Proposed in 1991
 04. INSTITUTE : Dept. of Spices & Plantation Crops, Tamil Nadu Agr. University, Coimbatore - 641 003, Tamil Nadu.
 05. PEDIGREE : Pure line selection from Acc. 695 of IARI
 06. AREAS OF ADOPTION : Tamil Nadu, Gujarat and Andhra Pradesh
 07. PLANTING SEASON : June-July / Oct-Nov
 08. SEED RATE : 10 kg/ha (at 25 x 15 cm spacing)
 09. CROP DURATION : 86 - 104 days
 10. AVERAGE YIELD : 650 kg/ha
 11. POTENTIAL YIELD : 1250 kg/ha
 12. QUALITY : Essential oil: 0.40%
 ATTRIBUTES



Fig.37 Field view of Co-3

13. MORPHOLOGICAL CHARACTERS:

- | | |
|--|--|
| 13.1 Plant height (cm) : 53.2 | 13.6 Shape of fruit : Oblong |
| 13.2 No. of primary branches/plant : 7.5 | 13.7 Grain size : Medium |
| 13.3 Days taken for 50% flowering : 45 | 13.8 Weight of 1000 seeds (g) : 16.2 |
| 13.4 No. of umbels per plant : 63 | 13.9 Colour of the grain : Brownish yellow |
| 13.5 No. of umbellates per umbel : 6.6 | |

14. REACTION TO MAJOR PESTS AND DISEASES:

- | | |
|--|------------------|
| 14.1 Wilt (<i>Fusarium oxysporum f.sp. corianderii</i>) | : Field tolerant |
| 14.2 Powdery mildew (<i>Erysiphe polygoni</i>) | : Field tolerant |
| 14.3 Stem gall (<i>Protomyces macrosporus</i>) | : - |
| 14.4 Grain mould (<i>Alternaria Sp., Curvularia Sp., Helminthosporium Sp.</i>) | : Field tolerant |
| 14.5 Aphid (<i>Myzus persicae</i>) | : Susceptible |
| 14.6 Weevil (<i>Tribolium castaneum</i>) | : Susceptible |

15. SPECIAL CHARACTERISTICS

: A dual purpose medium duration type suitable for both irrigated and rainfed conditions. Suitable for cultivation in both kharif and rabi seasons.

16. SPECIFIC RECOMMENDATIONS

: Recommended package of practices of Tamil Nadu Agricultural University are to be followed.

- 01. CROP : CORIANDER
- 02. VARIETY : CS-287
- 03. YEAR OF RELEASE : Proposed for release in 1991
- 04. INSTITUTE : Dept. of Spices & Plantation Crops, Tamil Nadu Agr. University, Coimbatore - 641 003, Tamil Nadu.
- 05. PEDIGREE : Reselection from CS-6 of Lam, Guntur
- 06. AREAS OF ADOPTION : Tamil Nadu



Fig. 38 CS-287, plant in flowering

- 07. PLANTING SEASON : June-July / Oct-Nov
 - 08. SEED RATE : 10 kg/ha, at a spacing of 22.5 x 15 cm
 - 09. CROP DURATION : 78 - 97 days
 - 10. AVERAGE YIELD : 600 Kg/ha
 - 11. POTENTIAL YIELD : 750 Kg/ha
 - 12. QUALITY : Essential oil: 0.38%
- ATTRIBUTES**

- 13. MORPHOLOGICAL CHARACTERS:**
- 13.1 Plant height (cm) : 48.2
 - 13.2 No. of primary branches/plant : 7.1
 - 13.3 Days taken for 50% flowering : 78.3
 - 13.4 No. of umbels per plant : 56.2
 - 13.5 No. of umbellates per umbel : 5.3

- 13.6 Shape of fruit : Oblong
- 13.7 Grain size : Medium
- 13.8 Weight of 1000 seeds (g) : 14.9
- 13.9 Colour of the grain : Straw yellow

- 14. REACTION TO MAJOR PESTS AND DISEASES:**
- 14.1 Wilt (*Fusarium oxysporum f.sp. corianderii*)
 - 14.2 Powdery mildew (*Erysiphe polygoni*)
 - 14.3 Stem gall (*Protomyces macrosporus*)
 - 14.4 Grain mould (*Alternaria Sp., Curvularia Sp., Helminthosporium Sp.*)
 - 14.5 Aphid (*Myzus persicae*)
 - 14.6 Weevil (*Tribolium castaneum*)

- : Tolerant
- : Susceptible
- : -
- : Tolerant
- : Susceptible
- : Susceptible

- 15. SPECIAL CHARACTERISTICS : An early maturing variety suitable for both irrigated and rainfed conditions.
- 16. SPECIFIC RECOMMENDATIONS : Package of practices of Tamil Nadu Agricultural University are to be followed.

01. CROP : CORIANDER
 02. VARIETY : Sindhu
 03. YEAR OF RELEASE : 1991
 04. INSTITUTE : Regional Agr. Res Station,
 Andhra Pradesh Agr. University, Lam,
 Guntur - 522 034,
 Andhra Pradesh.
 05. PEDIGREE : Mass selection from
 Warangal local (CS-2)
 06. AREAS OF ADOPTION : Andhra Pradesh
 07. PLANTING SEASON : Oct-Nov
 08. SEED RATE : 15 kg/ha
 09. CROP DURATION : 102 days
 10. AVERAGE YIELD : 1050 kg/ha
 11. POTENTIAL YIELD : 1200 kg/ha
 12. QUALITY : Essential oil: 0.40%
 ATTRIBUTES

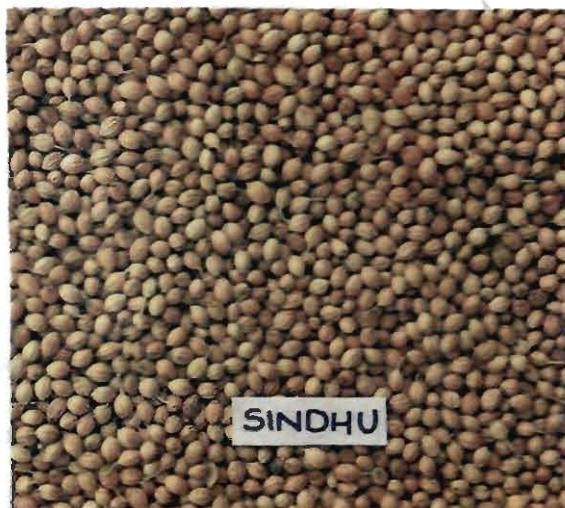


Fig.39 Mature fruits of Sindhu

13. MORPHOLOGICAL CHARACTERS:

- | | |
|--|---|
| 13.1 Plant height (cm) : 55 | 13.6 Shape of fruit : Oval |
| 13.2 No. of primary branches/plant : 5.9 | 13.7 Grain size : Medium |
| 13.3 Days taken for 50% flowering : 50 | 13.8 Weight of 1000 seeds (g) : 16.5 |
| 13.4 No. of umbels per plant : 21.5 | 13.9 Colour of the grain : Straw coloured |
| 13.5 No. of umbellates per umbel : 5.5 | |

14. REACTION TO MAJOR PESTS AND DISEASES:

- | | |
|--|---------------|
| 14.1 Wilt (<i>Fusarium oxysporum f.sp. corianderii</i>) | : Tolerant |
| 14.2 Powdery mildew (<i>Erysiphe polygoni</i>) | : Tolerant |
| 14.3 Stem gall (<i>Protomyces macrosporus</i>) | : - |
| 14.4 Grain mould (<i>Alternaria Sp., Curvularia Sp., Helminthosporium Sp.</i>) | : Susceptible |
| 14.5 Aphid (<i>Myzus persicae</i>) | : Resistant |
| 14.6 Weevil (<i>Tribolium castaneum</i>) | : Susceptible |

15. SPECIAL CHARACTERISTICS

- : A medium duration variety with high essential oil. Suitable for rainfed areas.

16. SPECIFIC RECOMMENDATIONS

- : The recommended package of practices of Andhra Pradesh Agricultural University may be followed.

01. CROP : CORIANDER
 02. VARIETY : UD-20
 03. YEAR OF RELEASE : Proposed for release in 1983
 04. INSTITUTE : SKN College of Agriculture, Rajasthan Agr. University, Jobner - 303 329.
 05. PEDIGREE : Recurrent selection from Jaipur local
 06. AREAS OF ADOPTION : Kota, Jhalawar, Bundi & Tonk Dists. of Rajasthan
 07. PLANTING SEASON : Oct-Nov
 08. SEED RATE : 12-15 kg/ha
 09. CROP DURATION : 110 days
 10. AVERAGE YIELD : 1200 kg/ha
 11. POTENTIAL YIELD : 2000 kg/ha
 12. QUALITY : Essential oil: 0.17%
 ATTRIBUTES

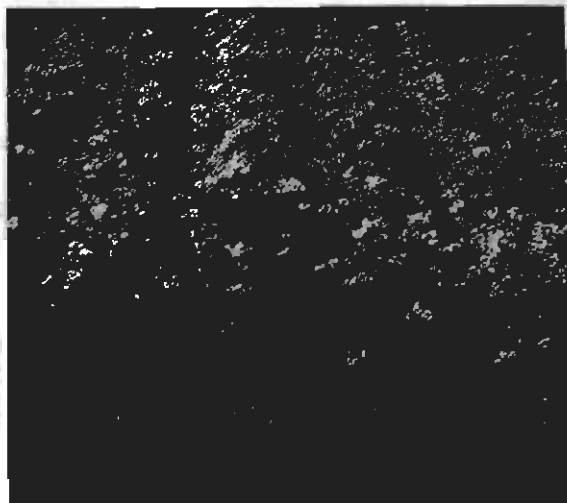


Fig.40 Plants of UD-20 in bloom

13. MORPHOLOGICAL CHARACTERS:

- | | |
|--|--|
| 13.1 Plant height (cm) : 59.5 | 13.6 Shape of fruit : Oblong |
| 13.2 No. of primary branches/plant : 5.2 | 13.7 Grain size : Bold |
| 13.3 Days taken for 50% flowering : 80 | 13.8 Weight of 1000 seeds (g) : 13.5 |
| 13.4 No. of umbels per plant : 25.6 | 13.9 Colour of the grain : Pale yellow |
| 13.5 No. of umbellates per umbel : 4.7 | |

14. REACTION TO MAJOR PESTS AND DISEASES:

- | | |
|--|-------------|
| 14.1 Wilt (<i>Fusarium oxysporum f.sp. corianderii</i>) | : Resistant |
| 14.2 Powdery mildew (<i>Erysiphe polygoni</i>) | : Tolerant |
| 14.3 Stem gall (<i>Protomyces macrosporus</i>) | : Resistant |
| 14.4 Grain mould (<i>Alternaria Sp., Curvularia Sp., Helminthosporium Sp.</i>) | : - |
| 14.5 Aphid (<i>Myzus persicae</i>) | : - |
| 14.6 Weevil (<i>Tribolium castaneum</i>) | : - |

15. SPECIAL CHARACTERISTICS : Suitable for rainfed conditions.

16. SPECIFIC RECOMMENDATIONS : Recommended for rainfed areas in heavy soil types of Kota, Jhalawar, Bundi and Tonk Districts of Rajasthan. Packages of practices as recommended by SKN College of Agriculture, RAJAU are to be followed.

CUMIN

Cumin is the dried ripe seed of *Cuminum cyminum* L. of the family Apiaceae. Cumin is indigenous to Egypt. It is now cultivated in Argentina, Cyprus, Denmark, India, Iran, Mexico, USSR, Syria, Turkey etc. In India, Cumin is cultivated in the states of Gujarat and Rajasthan in over 1,50,000 hectares producing over 80,000 tonnes of cumin per annum.

Cumin is a slender annual with a branched stem and long, narrow and deep green leaves. The inflorescence is an umbel with white or rose coloured flowers. The greyish bristly fruits (schizocarp) are about 6 mm long, tapering towards both ends and laterally compressed. The seed is yellowish brown with a short stalk. The mericarp is concave on one side with longitudinal ridges and numerous hairs.

Cumin is grown from seed, in rich loamy soil and well drained sunny areas up to 3000 m MSL. It cannot survive hot temperatures. Seeds are sown by broadcasting at the rate of 10-20 kg/ha and the crop comes to harvest in 3-4 months. Irrigation immediately after sowing is important. In general, 3-5 irrigations are required. NPK at the rate of 25:20:20 kg/ha is recommended for better yields.

Pests like weevil and aphids and diseases like *Fusarium* wilt, *Alternaria* blight are the major production constraints.

Crop rotation of cumin once in three years helps in growing disease-free crop. Organic amendments like neem cake is useful in checking wilt.

01. CROP : CUMIN
 02. VARIETY : Gujarat Cumin-1
 03. YEAR OF RELEASE : 1983
 04. INSTITUTE : Spices Research Station,
 Gujarat Agr. University,
 Jagudan - 382 710,
 Gujarat.
 05. PEDIGREE : Selection from local
 germplasm (Vijapur-5)
 06. AREAS OF
 ADOPTION : Gujarat & Rajasthan
 07. PLANTING SEASON : 1st week of Nov.
 08. SEED RATE : 15-20 kg/ha
 by broadcasting



Fig.43 Dried fruits of Guj. Cumin-1

09. CROP DURATION : 105 days
 10. AVERAGE YIELD : 700 kg/ha
 11. POTENTIAL YIELD : 1000 kg/ha
 12. QUALITY : Essential oil: 3.6% Crude fibre: 14.25% Moisture: 7.9%
 ATTRIBUTES

13. MORPHOLOGICAL CHARACTERS:

- | | | | |
|--------------------------|---------------------|------------------------------|-----------------|
| 13.1 Plant habit | : Bushy & spreading | 13.5 No. of umbellates/umbel | : 5.3 |
| 13.2 Plant height (cm) | : 30 | 13.6 No. seeds/umbellate | : 5.8 |
| 13.3 Days for flowering | : 51 | 13.7 1000 seed weight (g) | : 4.5 |
| 13.4 No. of umbels/plant | : 14.8 | 13.8 Fruit size | : Medium oblong |

14. REACTION TO MAJOR PESTS AND DISEASES:

- | | |
|---|-----------------------|
| 14.1 Fusarium Wilt (<i>Fusarium oxysporum f.sp. cumini</i>) | : Moderately Tolerant |
| 14.2 Alterbaria blight (<i>Alternaria burnsii</i>) | : Moderately Tolerant |
| 14.3 Powdery mildew (<i>Erysiphe polygoni</i>) | : Tolerant |
| 14.4 Aphids (<i>Aphis gossypii</i>) | : - |
| 14.5 Weevil (<i>Tribolium castaneum</i>) | : - |

15. SPECIAL CHARACTERISTICS : A variety with bold, linear oblong, ash brown grains with prominent white stripes. There is no problem of lodging and shattering.

16. SPECIFIC RECOMMENDATIONS : Crop rotation necessary. Irrigation 3-5 times first at the time of germination and later at 20 days interval. Recommended package of practices of Gujarat Agricultural University are to be followed.

- 01. CROP : CUMIN
- 02. VARIETY : **RZ-19**
(Rajasthan Zeera-19)
- 03. YEAR OF RELEASE : 1988
- 04. INSTITUTE : SKN College of
Agriculture,
Rajasthan Agricultural
University,
Jobner - 303 329,
Rajasthan.
- 05. PEDIGREE : Recurrent selection
from UC-19
- 06. AREAS OF
ADOPTION : Rajasthan & Gujarat
- 07. PLANTING SEASON : 1st week of Nov.
- 08. SEED RATE : 10 kg/ha (broad-
casting or line sowing
30 cm apart)
- 09. CROP DURATION : 125 days
- 10. AVERAGE YIELD : 500 kg/ha
- 11. POTENTIAL YIELD : 1000 kg/ha
- 12. QUALITY : Essential oil: 2.6% Crude fibre: - Moisture: -
ATTRIBUTES

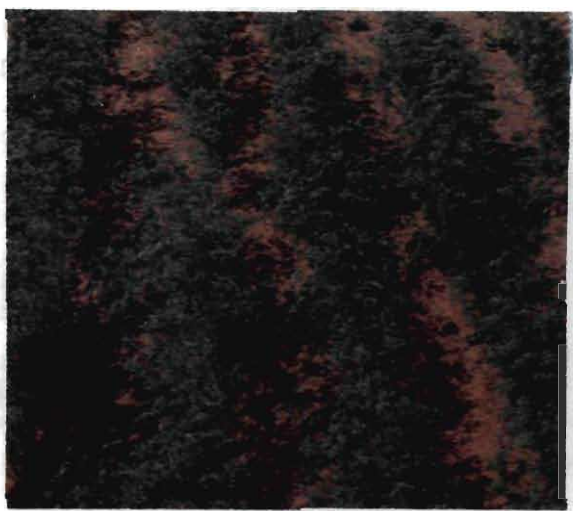


Fig.44 Field view of RZ-19

13. MORPHOLOGICAL CHARACTERS:

- | | | | |
|--------------------------|---------|------------------------------|--------|
| 13.1 Plant habit | : Erect | 13.5 No. of umbellates/umbel | : 4.8 |
| 13.2 Plant height (cm) | : 34.5 | 13.6 No. seeds/umbellate | : 5.6 |
| 13.3 Days for flowering | : 84 | 13.7 1000 seed weight (g) | : 4.7 |
| 13.4 No. of umbels/plant | : 20.1 | 13.8 Fruit size | : Bold |

14. REACTION TO MAJOR PESTS AND DISEASES:

- 14.1 Fusarium Wilt (*Fusarium oxysporum f.sp. cumini*) : Tolerant
- 14.2 Alterbaria blight (*Alternaria burnsii*) : Tolerant
- 14.3 Powdery mildew (*Erysiphe polygoni*) : Susceptible
- 14.4 Aphids (*Aphis gossypii*) : Susceptible
- 14.5 Weevil (*Tribolium castaneum*) : -

15. SPECIAL CHARACTERISTICS : An erect plant with dark grey, bold, pubescent and lustrous grains. Well adapted to late sown conditions.

16. SPECIFIC RECOMMENDATIONS : Crop rotation necessary. Package of practices recommended by SKN College of Agriculture, RAJAU are to be followed.

01. CROP : CUMIN
 02. VARIETY : Gujarat Cumin-2 (MC-43-73)
 03. YEAR OF RELEASE : Proposed in 1991
 04. INSTITUTE : Spices Research Station, Gujarat Agricultural University, Jagudan - 382 710, Gujarat.
 05. PEDIGREE : Pure line selection from M2 of γ - irradiated seeds of MC-43
 06. AREAS OF ADOPTION : Gujarat



Fig. 45 Guj. Cumin-2, a single plant

07. PLANTING SEASON : First week of Nov.
 08. SEED RATE : 20 kg/ha (broadcasting)
 09. CROP DURATION : 100 days
 10. AVERAGE YIELD : 700 kg/ha
 11. POTENTIAL YIELD : 1000 kg/ha
 12. QUALITY ATTRIBUTES : Essential oil: 4% Crude fibre: 22.1% Moisture: 6.5%

13. MORPHOLOGICAL CHARACTERS:

- | | | | |
|-----------------------------|---------|------------------------------|----------|
| 13.1 Plant habit | : Bushy | 13.5 No. of umbellates/umbel | : 5.3 |
| 13.2 Plant height (cm) | : 20 | 13.6 No. seeds/umbellate | : 5.0 |
| 13.3 Days for 50% flowering | : 52 | 13.7 1000 seed weight (g) | : 4.7 |
| 13.4 No. of umbels/plant | : 14.8 | 13.8 Fruit size | : Medium |

14. REACTION TO MAJOR PESTS AND DISEASES:

- | | |
|---|-----------------------|
| 14.1 Fusarium Wilt (<i>Fusarium oxysporum f.sp. cumini</i>) | : Moderately Tolerant |
| 14.2 Alterbaria blight (<i>Alternaria burnsii</i>) | : Moderately Tolerant |
| 14.3 Powdery mildew (<i>Erysiphe polygoni</i>) | : Moderately Tolerant |
| 14.4 Aphids (<i>Aphis gossypii</i>) | : - |
| 14.5 Weevil (<i>Tribolium castaneum</i>) | : - |

15. SPECIAL CHARACTERISTICS : A bushy plant with good branching habit. Seeds are attractive and brownish grey in colour.

16. SPECIFIC RECOMMENDATIONS : Crop rotation necessary. Package of practices recommended by Gujarat Agricultural University are to be followed.

FENNEL

Fennel is the dried fruit of *Foeniculum vulgare* Mill (Syn : *Anthium foeniculum* L.) of the family Apiaceae. Though fennel is the native of Southern Europe and the Mediterranean areas, it is widely cultivated throughout the sub-tropical and temperate regions of the world. In India, fennel is cultivated in over 18,000 hectares of area producing 20,000 tonnes of the spice. Its cultivation is confined mostly to Gujarat, Rajasthan and to some extent in Uttar Pradesh, Madhya Pradesh, Karnataka, Haryana and Punjab.

Fennel is an erect, glabrous, annual herb growing up to 2 m tall with many branches. Leaves alternate, decumbent hexa-pinnately divided into filiform acute lobes. Inflorescence is a compound umbel. Fruits are ovoid to oblong schizocarps. The yellow to gray brown mericarps are slightly concave on one side with prominent ridges.

Fennel is a cold weather crop and thrives well in well-drained loamy or black or sandy soils in sunny areas. Propagation is by seeds. A seed rate of 9-12 kg/ha is ideal with a spacing of 60 x 30 cm. The plants come to harvest 6-8 months after sowing. They can be either sown directly or first raised in nursery and transplanted. Application of 90:60:90 kg/ha NPK and farm yard manure at the rate of 25 t/ha will increase the yield. About 7-8 irrigations at 15-20 days interval are necessary. Since all the fruits do not mature at a time, harvesting at 4-5 days interval is ideal.

Powdery mildew, sugary disease and blight are the major diseases and aphids are the major pests of fennel. Spraying 0.03% dimethoate or 0.02% phosphamidon controls aphids. Spraying 0.1% wettable sulphur at 15-20 days interval will control powdery mildew. Spraying 0.2% dithane M-45 twice at 60 and 90 days after sowing controls blight.

01. CROP : FENNEL
 02. VARIETY : S-7-9
 03. YEAR OF RELEASE : 1956
 04. INSTITUTE : Spices Res. Station,
 Gujarat Agricultural
 University,
 Jagudan - 382 701,
 Gujarat.
 05. PEDIGREE : Selection
 06. AREAS OF
 ADOPTION : Gujarat
 07. PLANTING SEASON : June - nursery
 August - transplanting



Fig. 46 S-7-9, Field view

08. SEED RATE : 2.5 kg/ha
 09. CROP DURATION : 210 days
 10. AVERAGE YIELD : 1100 kg/ha
 11. POTENTIAL YIELD : 1500 kg/ha
 12. QUALITY : Essential oil: 1.2% Moisture: 7.4% Crude fibre: 24%
 ATTRIBUTES Soluble carbohydrate: 32%

13. MORPHOLOGICAL CHARACTERS:

- | | | | |
|------------------------------|---------|-------------------------------|--------|
| 13.1 Plant habit | : Bushy | 13.5 No. of umbels/plant | : 28.8 |
| 13.2 Plant height (cm) | : 172 | 13.6 No. of umbellates/umbel | : 23.9 |
| 13.3 No. of primary branches | : 8.5 | 13.7 No. of grains/umbellate | : 24.5 |
| 13.4 Days for flowering | : 69 | 13.8 Weight of 1000 seeds (g) | : 6.5 |

14. REACTION TO MAJOR PESTS AND DISEASES:

- | | |
|--|-----------------------|
| 14.1 Sugary diseases (<i>Sclerotinia sclerotiorum</i>) | : Susceptible |
| 14.2 Leaf spot (<i>Alternaria umbellifericola</i>) | : Susceptible |
| 14.3 Leaf blight (<i>Ramularia foeniculi</i>) | : Moderately tolerant |
| 14.4 Weevil (<i>Tribolium castaneum</i>) | : - |
| 14.5 Caterpillar (<i>Spodoptera litura</i>) | : - |

15. SPECIAL CHARACTERISTICS : Plants with bushy habit and big umbels.
 16. SPECIFIC RECOMMENDATIONS : Package of practices recommended by the Gujarat Agricultural University are to be followed.

01. CROP : FENNEL
 02. VARIETY : PF-35
 03. YEAR OF RELEASE : 1973
 04. INSTITUTE : Spices Res. Station,
 Gujarat Agricultural
 University,
 Jagudan - 382 701,
 Gujarat.
 05. PEDIGREE : Selection from local
 germplasm
 06. AREAS OF
 ADOPTION : Gujarat
 07. PLANTING SEASON : June-in nursery
 August-transplanting
 at 45 x 10 cm spacing



Fig.47 Field view of PF-35

08. SEED RATE : 2.5 kg/ha
 09. CROP DURATION : 225 days
 10. AVERAGE YIELD : 1280 kg/ha
 11. POTENTIAL YIELD : 1500 Kg/ha
 12. QUALITY : Essential oil: 1.2% Moisture: 7.8%
 ATTRIBUTES Crude fibre: 27.3% Soluble carbohydrate: 34.2%

13. MORPHOLOGICAL CHARACTERS:

- | | | | |
|------------------------------|--------------------|-------------------------------|-------|
| 13.1 Plant habit | : Tall & spreading | 13.5 No. of umbels/plant | : 36 |
| 13.2 Plant height (cm) | : 148 | 13.6 No. of umbellates/umbel | : 67 |
| 13.3 No. of primary branches | : 7.3 | 13.7 No. of grains/umbellate | : 26 |
| 13.4 Days for flowering | : 105 | 13.8 Weight of 1000 seeds (g) | : 8.9 |

14. REACTION TO MAJOR PESTS AND DISEASES:

- | | |
|--|-----------------------|
| 14.1 Sugary diseases (<i>Sclerotinia sclerotiorum</i>) | : Moderately tolerant |
| 14.2 Leaf spot (<i>Alternaria umbellifericola</i>) | : Moderately tolerant |
| 14.3 Leaf blight (<i>Ramularia foeniculi</i>) | : Moderately tolerant |
| 14.4 Weevil (<i>Tribolium castaneum</i>) | : - |
| 14.5 Caterpillar (<i>Spodoptera litura</i>) | : - |

15. SPECIAL CHARACTERISTICS : A moderately spreading, tall, big umbelled variety. Seed medium sized, hairless, green with fine ridges, and is attractive.

16. SPECIFIC RECOMMENDATIONS : Raised beds may be prepared for the nursery if the soil is heavy black type. FYM @ 25 tonnes/ha is recommended. Recommended package of practices of GAU are to be followed.

01. CROP : FENNEL
02. VARIETY : Gujarat Fennel-1
03. YEAR OF RELEASE : 1985
04. INSTITUTE : Spices Res. Station,
Gujarat Agricultural
University,
Jagudan - 382 701,
Gujarat.
05. PEDIGREE : Pure line selection
(VC - 14 - 3 - 3) from
Vijapur local
06. AREAS OF
ADOPTION : Gujarat & Rajasthan
07. PLANTING SEASON : Jun-Aug. in nursery
Aug-Oct. transplanting
at 80 x 60 cm spacing
08. SEED RATE : 2.5 kg/ha
09. CROP DURATION : 225 days
10. AVERAGE YIELD : 1695 kg/ha
11. POTENTIAL YIELD : 3000 kg/ha
12. QUALITY : Essential oil: 1.6% Moisture: 7.6%
ATTRIBUTES Crude fibre: 24% Soluble carbohydrate: 35.5%

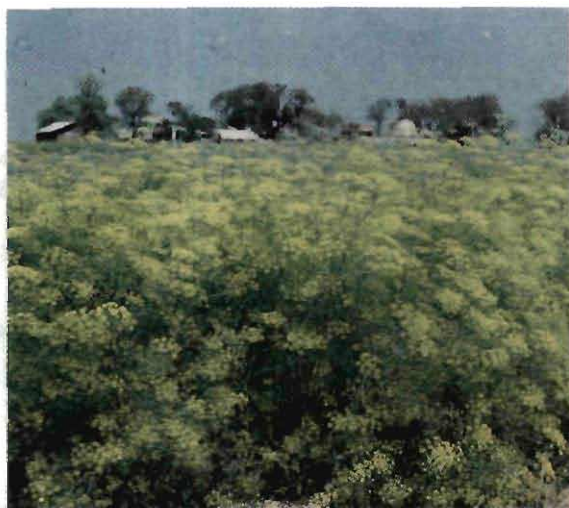


Fig.48 Guj. Fennel-1, field view

13. MORPHOLOGICAL CHARACTERS:

- | | | | |
|------------------------------|----------------|-------------------------------|--------|
| 13.1 Plant habit | : Tall & bushy | 13.5 No. of umbels/plant | : 34.9 |
| 13.2 Plant height (cm) | : 150 | 13.6 No. of umbellates/umbel | : 68.4 |
| 13.3 No. of primary branches | : 9.6 | 13.7 No. of grains/umbellate | : 21.1 |
| 13.4 Days for flowering | : 95 | 13.8 Weight of 1000 seeds (g) | : 9.8 |

14. REACTION TO MAJOR PESTS AND DISEASES:

- | | |
|--|-----------------------|
| 14.1 Sugary diseases (<i>Sclerotinia sclerotiorum</i>) | : Moderately tolerant |
| 14.2 Leaf spot (<i>Alternaria umbellifericola</i>) | : Moderately tolerant |
| 14.3 Leaf blight (<i>Ramularia foeniculi</i>) | : Susceptible |
| 14.4 Weevil (<i>Tribolium castaneum</i>) | : - |
| 14.5 Caterpillar (<i>Spodoptera litura</i>) | : - |

15. SPECIAL CHARACTERISTICS : The plant is tall, spreading & bushy type with oblong, medium bold & dark green seeds. There is no problem of shattering and less prone to lodging. Suitable for early sowing as well as rabi crop. Reasonably tolerant to drought.
16. SPECIFIC RECOMMENDATIONS : Package of practices recommended by Gujarat Agricultural University to be followed.

01. CROP : FENNEL
 02. VARIETY : Co-1
 03. YEAR OF RELEASE : 1985
 04. INSTITUTE : Dept. of Spices and
 Plantation Crops,
 Tamil Nadu Agr.
 University,
 Coimbatore 641 003,
 Tamil Nadu.

05. PEDIGREE : Reselection from
 PF-35

06. AREAS OF
 ADOPTION : Tamil Nadu

07. PLANTING SEASON : May - June and
 October-November

08. SEED RATE : 3-4 kg (transplanting
 at 60 x 30 cm spacing)

09. CROP DURATION : 220 days

10. AVERAGE YIELD : 567 kg/ha

11. POTENTIAL YIELD : 825 kg/ha

12. QUALITY : Essential oil: 1.2% Moisture: -
 ATTRIBUTES Crude fibre: - Soluble carbohydrate: -

13. MORPHOLOGICAL CHARACTERS:

13.1 Plant habit	: Medium statured	13.5 No. of umbels/plant	: 31.4
13.2 Plant height (cm)	: 118.6	13.6 No. of umbellates/umbel	: 32.6
13.3 No. of primary branches	: 10.2	13.7 No. of grains/umbellate	: 26.2
13.4 Days for flowering	: 110	13.8 Weight of 1000 seeds (g)	: -

14. REACTION TO MAJOR PESTS AND DISEASES:

14.1 Sugary diseases (<i>Sclerotinia sclerotiorum</i>)	: Susceptible
14.2 Leaf spot (<i>Alternaria umbellifericola</i>)	: Susceptible
14.3 Leaf blight (<i>Ramularia foeniculi</i>)	: Susceptible
14.4 Weevil (<i>Tribolium castaneum</i>)	: Susceptible
14.5 Caterpillar (<i>Spodoptera litura</i>)	: Susceptible

15. SPECIAL CHARACTERISTICS : A medium statured variety with diffuse branching. Suitable for drought prone, water logged, saline and alkaline conditions. Suitable for hilly areas as well as for inter cropping and border cropping.

16. SPECIFIC RECOMMENDATIONS : Recommended package of practices of Tamil Nadu Agricultural University are to be followed.



Fig.49 Field view of Co-1

FENUGREEK

Fenugreek is the dried seed of *Trigonella foenum - graceum* L. of the family Fabaceae.

Fenugreek is indigenous to the countries bordering the eastern shores of the Mediterranean, extending to Central Asia. An independent centre of origin exists in Ethiopia. In India, it is cultivated in the states of Rajasthan, Gujarat, Andhra Pradesh, Tamil Nadu, Uttar Pradesh and Haryana. An area of about 30,000 hectares is under fenugreek cultivation with the production of about 31,000 tonnes per annum. Both grains and leaves (greens) are used.

Fenugreek is an erect, annual herb, 30-80 cm tall with trifoliolate leaves and bluish white or yellow flowers. Seeds are brownish yellow, oblong with deep groove across one corner giving seeds a hooked appearance.

Fenugreek is propagated by seeds at the rate of 10-12 kg/ha with a spacing of 30 x 15 cm. The crop comes to harvest 70-150 days after planting. A fertiliser dose of 25:25:50 kg/ha NPK is recommended. Farm yard manure at the rate of 10-15 tonnes/ha increases yields substantially.

Root rot, powdery mildew and leaf spot are the major production constraints. Drenching of carbendazim 0.1% will control the root rot. Spraying karathane 0.1% will control powdery mildew.

01. CROP : FENUGREEK
 02. VARIETY : Co-1
 03. YEAR OF RELEASE : 1982
 04. INSTITUTE : Dept. of Spices and
 Plantation Crops,
 Tamil Nadu Agr.
 University,
 Coimbatore - 641 003,
 Tamil Nadu.

05. PEDIGREE : Reselection from
 TG 2336 of IARI

06. AREAS OF
 ADOPTION : Tamil Nadu

07. PLANTING SEASON : June-July /
 October-November

08. SEED RATE : 12.5 kg/ha

09. CROP DURATION : 95 days
 (20-25 days for greens)

10. AVERAGE YIELD : 680 kg/ha
 (4000 kg/ha of greens)

11. POTENTIAL YIELD : 750 kg/ha
 (5000 kg/ha of greens)

12. QUALITY : Diosgenin: - Leaf protein: 15.9% Seed protein: 21.7%
 ATTRIBUTES

13. MORPHOLOGICAL CHARACTERS:

13.1 Plant habit	: Short	13.6 No. of seeds/pod	: 17.1
13.2 Colour of plant	: Green	13.7 Pod length (cm)	: 12.4
13.3 Plant height (cm)	: 50	13.8 Size of seeds (cm)	: Medium
13.4 No. of branches/plant	: 6.9	13.9 Weight of 1000 seeds (g)	: 12.6
13.5 No. of pods/plant	: 31	13.10 Colour of seeds	: Brownish orange

14. REACTION TO MAJOR PESTS AND DISEASES:

14.1 Root rot (<i>Rhizoctonia solani</i>)	: Field tolerant
14.2 Powdery mildew (<i>Erysiphe polygoni</i>)	: Susceptible
14.3 Caterpillar (<i>Spodoptera litura</i>)	: Susceptible
14.4 Aphids (<i>Aphis gossypii</i>)	: Susceptible

15. SPECIAL CHARACTERISTICS : A quick growing dual purpose type.

16. SPECIFIC RECOMMENDATIONS : Recommended package of practices of Tamil Nadu
 Agricultural University are to be followed.



Fig.50 Mature plants of Co-1

01. CROP : FENUGREEK
 02. VARIETY : **Rajendra Kanti**
 03. YEAR OF RELEASE : 1987
 04. INSTITUTE : Dept. of Horticulture,
 Tirhut College of
 Agriculture,
 Dholi - 843 121, Bihar.
 05. PEDIGREE : A mass selection
 (RM-16) from
 Reghunathpur
 germplasm
 06. AREAS OF
 ADOPTION : Plains of N. Bihar
 07. PLANTING SEASON : 3rd week of Oct.
 08. SEED RATE : 10-12 kg/ha
 (spacing 30 x 20 cm)

09. CROP DURATION : 120 days
 10. AVERAGE YIELD : 1250 kg/ha
 11. POTENTIAL YIELD : 4000 kg/ha
 12. QUALITY : Diosgenin: -
 ATTRIBUTES

13. MORPHOLOGICAL CHARACTERS:

- | | | | |
|----------------------------|--------------|-------------------------------|-----------------|
| 13.1 Plant habit | : Tall Bushy | 13.6 No. of seeds/pod | : 15 |
| 13.2 Colour of plant | : Green | 13.7 Pod length (cm) | : 14 |
| 13.3 Plant height (cm) | : 70 | 13.8 Size of seeds (cm) | : Medium |
| 13.4 No. of branches/plant | : 15 | 13.9 Weight of 1000 seeds (g) | : 12.9 |
| 13.5 No. of pods/plant | : 105 | 13.10 Colour of seeds | : Golden yellow |

14. REACTION TO MAJOR PESTS AND DISEASES:

- | | |
|--|------------------------|
| 14.1 Root rot (<i>Rhizoctonia solani</i>) | : Susceptible |
| 14.2 Powdery mildew (<i>Erysiphe polygoni</i>) | : Moderately resistant |
| 14.3 Caterpillar (<i>Spodoptera litura</i>) | : Moderately resistant |
| 14.4 Aphids (<i>Aphis gossypii</i>) | : Moderately resistant |

15. SPECIAL CHARACTERISTICS : A medium sized bushy plant with creamy white flowers. Takes 42 days for flowering. Resistant to *Cercospora* leaf spot. Suitable for intercropping in both kharif and rabi seasons.

16. SPECIFIC RECOMMENDATIONS : Two irrigations one after 25 days of sowing and the other at flowering is essential. NPK @ 20:32:25 kg/ha along with 10 tonnes of FYM is recommended.



Fig.51 Rajendra Kanti - a field view

- 01. CROP : FENUGREEK
- 02. VARIETY : RMt - 1
- 03. YEAR OF RELEASE : 1989
- 04. INSTITUTE : SKN College of Agriculture,
Rajasthan Agricultural University,
Jobner - 303 329,
Rajasthan.
- 05. PEDIGREE : Pure line selections (RMt-1) from Nagaur local
- 06. AREAS OF ADOPTION : Rajasthan

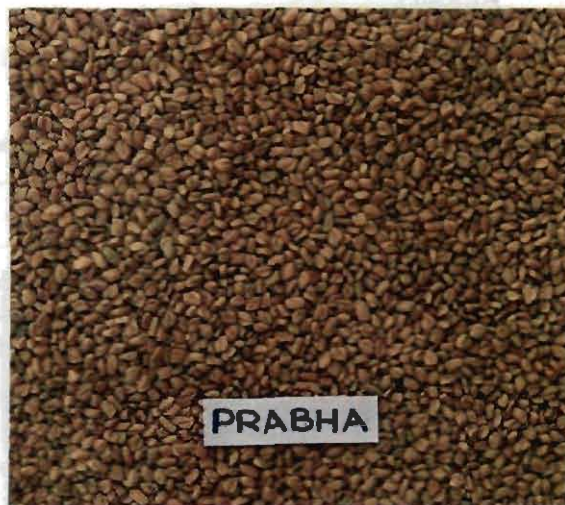


Fig.52 Mature seeds of RMt-1

- 07. PLANTING SEASON : 1st week of Nov.
- 08. SEED RATE : 10-12 kg/ha
spacing 15 x 30 cm
- 09. CROP DURATION : 145 days
- 10. AVERAGE YIELD : 1560 kg/ha
- 11. POTENTIAL YIELD : 2500 kg/ha
- 12. QUALITY ATTRIBUTES : Diosgenin: 0.2%

Leaf protein: - Seed protein: 21%

13. MORPHOLOGICAL CHARACTERS:

- | | |
|--------------------------------------|--------------------------------------|
| 13.1 Plant habit : Semi erect, tall | 13.6 No. of seeds/pod : 15.6 |
| 13.2 Colour of plant : Pinkish green | 13.7 Pod length (cm) : 10.45 |
| 13.3 Plant height (cm) : 66.1 | 13.8 Size of seeds : Medium bold |
| 13.4 No. of branches/palnt : 5.5 | 13.9 Weight of 1000 seeds (g) : 13.4 |
| 13.5 No. of pods/plant : 48 | 13.10 Colour of seeds : Yellow |

14. REACTION TO MAJOR PESTS AND DISEASES:

- 14.1 Root rot (*Rhizoctonia solani*) : Moderately resistant
- 14.2 Powdery mildew (*Erysiphe polygoni*) : Tolerant
- 14.3 Caterpillar (*Spodoptera litura*) : -
- 14.4 Aphids (*Aphis gossypii*) : Susceptible

15. SPECIAL CHARACTERISTICS

: Vigorous plant with distinct pink colour at the base of the stem. Grains medium sized and attractive. It has quicker early growth and takes 60 days to flower. Tolerant to root knot nematode.

16. SPECIFIC RECOMMENDATIONS

: 5-7 irrigations required. Higher temperature during filling period affects yield adversely. Recommended package of practices of SKN College of Agriculture, RAJAU are to be followed.

01. CROP : FENUGREEK
02. VARIETY : Lam Selection - 1
03. YEAR OF RELEASE : Proposed in 1992
04. INSTITUTE : RARS, Andhra Pradesh
Agr. University, Lam,
Guntur - 522 034,
Andhra Pradesh.
05. PEDIGREE : Selection from
germplasm collected
from Madhya Pradesh
06. AREAS OF
ADOPTION : Andhra Pradesh
07. PLANTING SEASON : Last week of October
08. SEED RATE : 10-15 kg.
09. CROP DURATION : 90 days
10. AVERAGE YIELD : 740 kg/ha (grains)
10000 kg/ha (greens)
11. POTENTIAL YIELD : 1000 kg/ha (grains)
13,000 kg/ha (greens)



Fig.53 Lam Sel.1 - field view

12. QUALITY
ATTRIBUTES : Diosgenin: - Leaf protein: - Seed protein: 53%

13. MORPHOLOGICAL CHARACTERS:

- | | | | |
|----------------------------|---------|-------------------------------|--------------------|
| 13.1 Plant habit | : Bushy | 13.6 No. of seeds/pod | : 15 |
| 13.2 Colour of plant | : Green | 13.7 Pod length (cm) | : 10 |
| 13.3 Plant height (cm) | : 40 | 13.8 Size of seeds (cm) | : Medium |
| 13.4 No. of branches/plant | : 7 | 13.9 Weight of 1000 seeds (g) | : 11 |
| 13.5 No. of pods/plant | : 21 | 13.10 Colour of seeds | : Golden
Yellow |

14. REACTION TO MAJOR PESTS AND DISEASES:

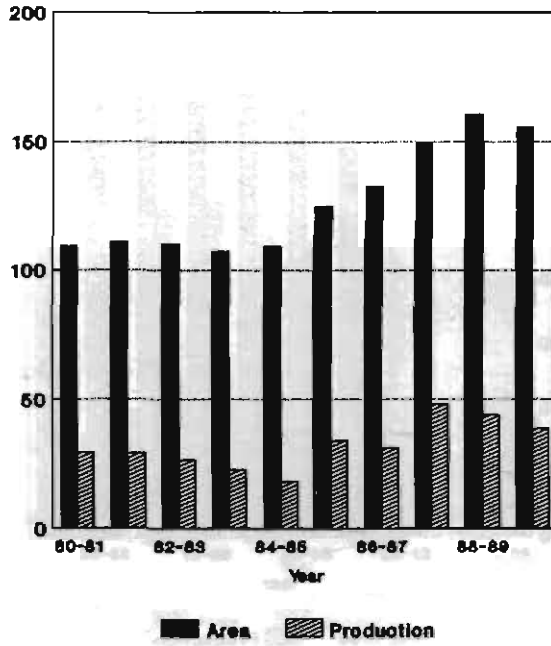
- | | |
|--|------------|
| 14.1 Root rot (<i>Rhizoctonia solani</i>) | : Tolerant |
| 14.2 Powdery mildew (<i>Erysiphe polygoni</i>) | : Tolerant |
| 14.3 Caterpillars (<i>Spodoptera litura</i>) | : Tolerant |
| 14.4 Aphids (<i>Aphis gossypii</i>) | : Tolerant |

15. SPECIAL CHARACTERISTICS : A dual purpose early maturing type with bushy plant and gives high yield of greens. Plant green with pinkish leaf margins. It takes 35 days to flower.

16. SPECIFIC RECOMMENDATIONS : Recommended package of practices of Andhra Pradesh Agricultural University are to be followed.

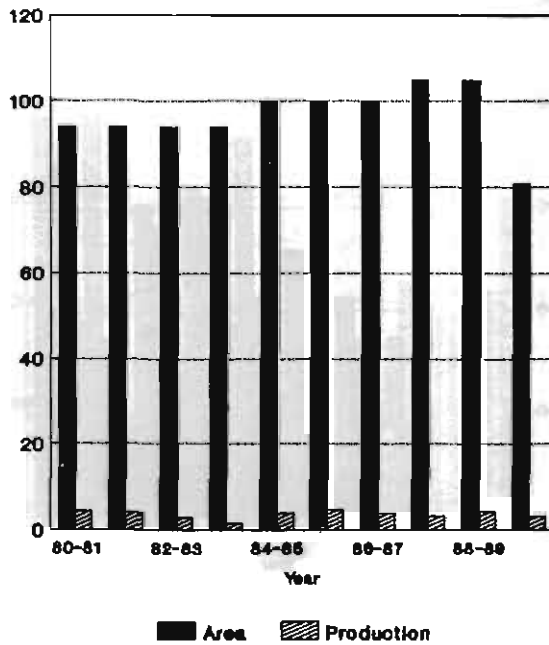
**AREA AND PRODUCTION OF PEPPER
IN INDIA**

ANNEXURE - I



Area in '000ha, Production in '000t

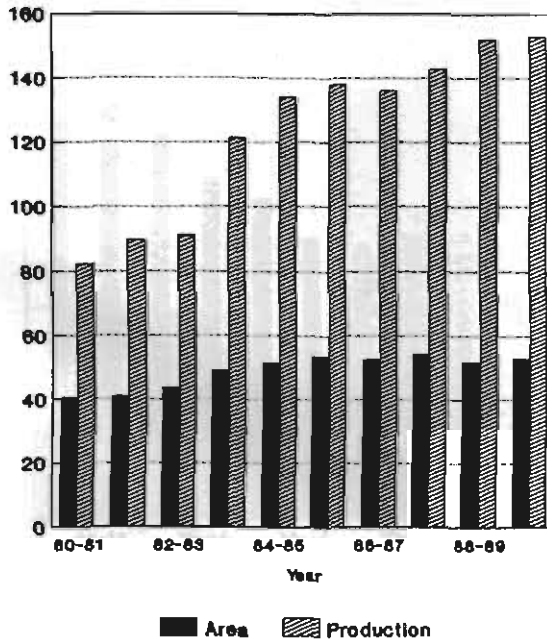
**AREA AND PRODUCTION OF SMALL CARDAMOM
IN INDIA**



Area in '000ha, Production in '000t

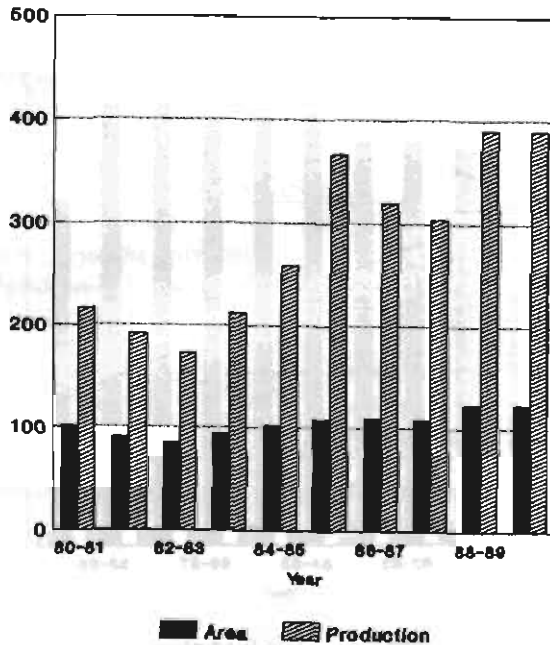
**AREA AND PRODUCTION OF GINGER
IN INDIA**

ANNEXURE - II



Area in '000ha, Production in '000t

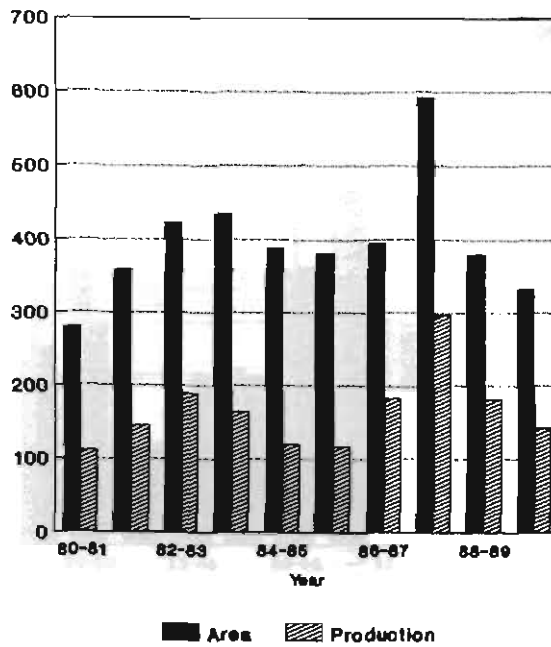
**AREA AND PRODUCTION OF TURMERIC
IN INDIA**



Area in '000ha, Production in '000t

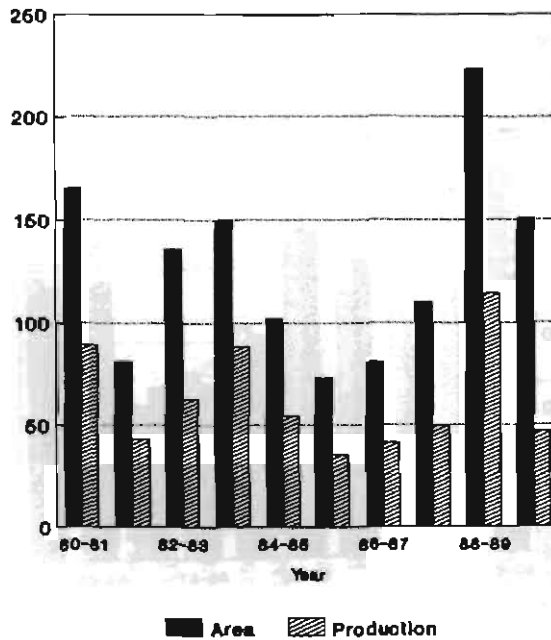
AREA AND PRODUCTION OF CORIANDER IN INDIA

ANNEXURE - III



Area in '000ha, Production in '000t

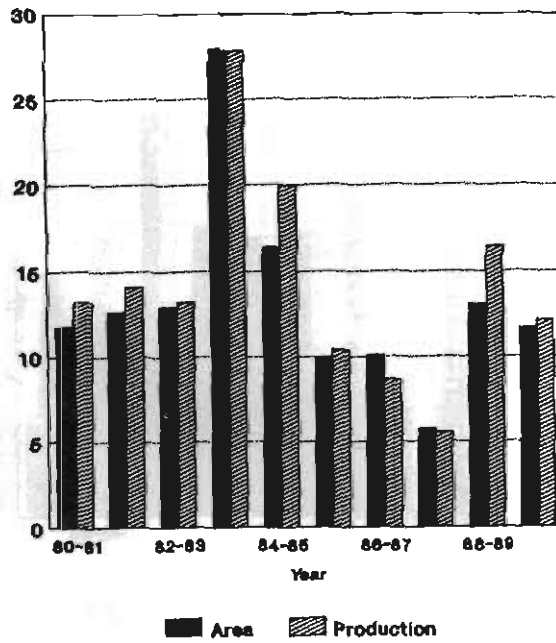
AREA AND PRODUCTION OF CUMIN IN INDIA



Area in '000ha, Production in '000t

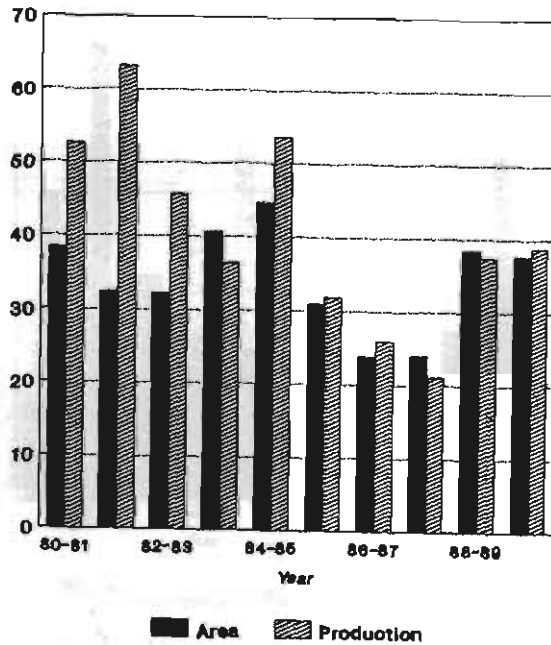
**AREA AND PRODUCTION OF FENNEL
IN INDIA**

ANNEXURE - IV



Area in '000ha, Production in '000t

**AREA AND PRODUCTION OF FENUGREEK
IN INDIA**

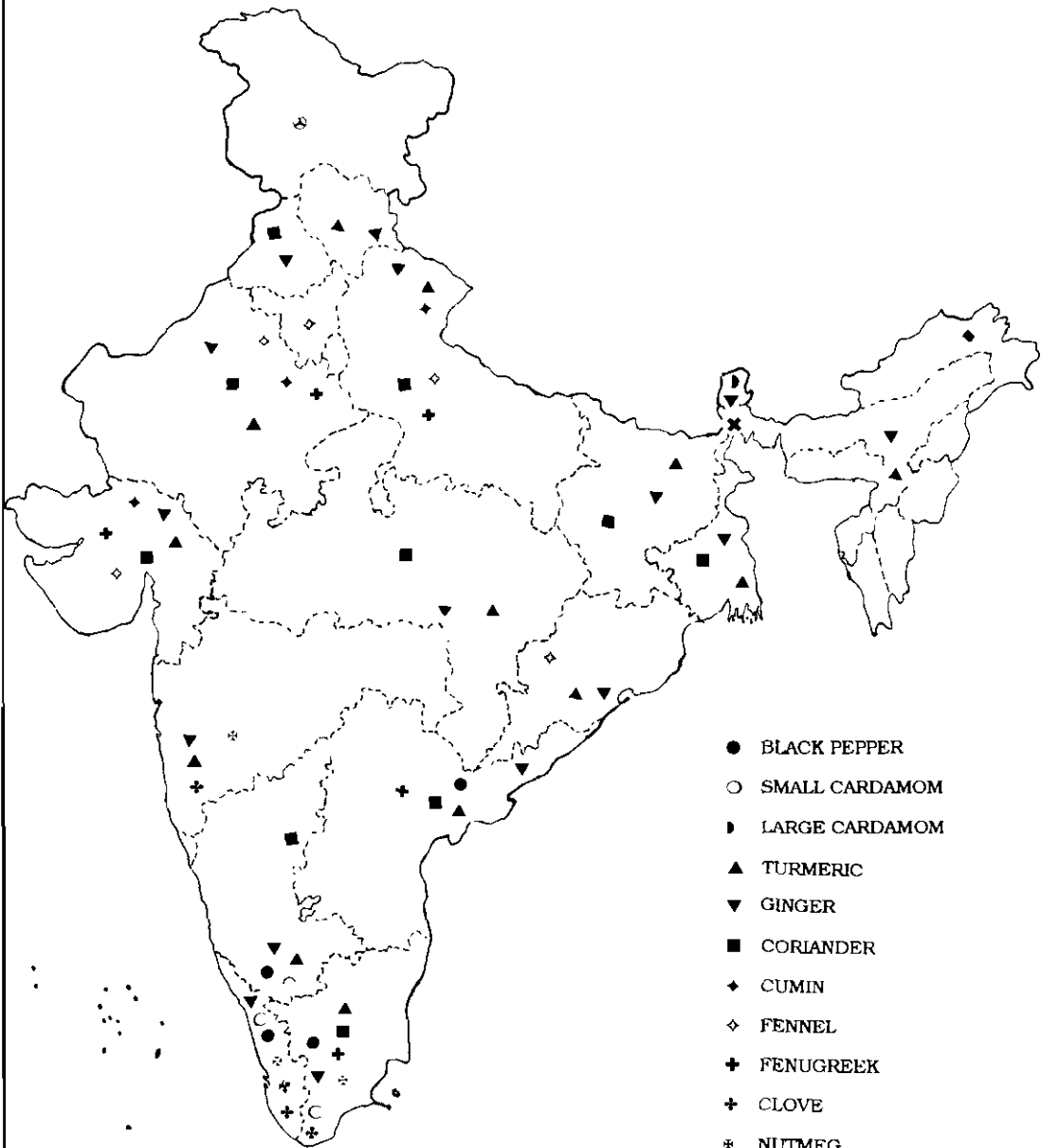


Area in '000ha, Production in '000t

Common vernacular names of spices

Botanical Name	Somatic Chromosome No.	Family	Part used as spice	Hindi	Malayalam	Tamil	Kannada	Telugu
1. BLACK PEPPER <i>Piper nigrum</i> , L.	52	Piperaceae	Dried fruit	Kalimirsch	Kurumulagu	Milagu	Karimenasu	Mirialu
2. CARDAMOM <i>Elettaria cardamomum</i> , Maton	48	Zingiberaceae	Dried fruit	Elatchi	Elam	Elakkai	Yelakki	Yelakulu
3. GINGER <i>Zingiber officinale</i> , Rosc.	22	Zingiberaceae	Rhizomes	Adrak	Inji	Inji	Shunti	Allam
4. TURMERIC <i>Curcuma domestica</i> , Val.	63	Zingiberaceae	Dried rhizome	Haldi	Manjal	Manjal	Harisana	Pasupu
5. CORIANDER <i>Coriandrum sativum</i> , L.	22	Apiaceae	Dried fruit	Dhania	Kothamalli	Kotha- malli	Kothumbari	Dhanialu
6. CUMIN <i>Cuminum cyminum</i> , L.	14	Apiaceae	Dried fruit	Safed jeera	Jiragam	Jiragam	Jeerigae	Jeelakarra
7. FENNEL <i>Foeniculum vulgare</i> , Mill.	22	Apiaceae	Dried fruit	Somph	Perum- jeeragam	Perum- jeeragam	Sompu	Sompu
8. FENUGREEK <i>Trigonella foenum - graecum</i> , L.	16	Fabaceae	Dried seed	Methi	Uluva	Ventha- yam	Menthya	Menthulu

**CULTIVATION OF IMPORTANT
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