Indian Cocoa, Arecanut & Spices Journal. Vol. XVIII, No. 4 Issue

GROWTH REGULATORS IN BLACK PEPPER PRODUCTION

K. KANDIANNAN, K. SIVARAMAN AND C.K. THANKAMANI

National Research Centre for Spices, P.O. Marikunnu, Calicut (Kozhikode)-673 012, Kerala, India

ABSTRACT

Black pepper is an important spice and it has unique place in spice trade. India is one of the largest producers and exporters of pepper using growth regulators is one of the options to boost the crop yield. In his paper authors compiled the available information on the use of growth regulators in black pepper production. Growth regulators promote the growth, helps better rooting, prevents spike shedding, accelerate the berry development and enhance the yield.

INTRODUCTION

Black pepper (*Piper nigrum*) is an important spice crop and has unique position in spice trade. India's contribution to the world market is considerable (22.72%). In India, it is cultivated in an area of 1.6 lakh ha with the production of 55000 tonnes. More than 90 per cent of the area and production is confined to Kerala. The global demand for black pepper by 2000 AD was estimated as 1.86 lakh tonnes. Hence, our share has to be increased to meet the demand. Efforts to optimise crop yields have until now been directed to improve cultivation techniques, adequate supplies of nutrients and water, selection and breeding for more favourable plant straints, hybridization ing for more favourable plant straints, hybridization ever, to realise the maximal crop yield potential, it will be necessary also to overcome the limitations caused by the natural growth regulatory systems. The metabolic reactions in plants are controlled both the supply and conversion of nutrients and by their endogenous hormonal pattern (Halmann, 1990). The use of plant growth regulators enable rapid changes in the phenotype of the plant within one season, to achieve desirable results (Luckwill, 1985).

Plant growth regulators are synthetic chemical substances other than nutrients, which can modify the growth when added in small amounts, usually by stimulating or inhibiting part of the endogenous growth regulators. Synthetic plant growth regulators hold the promise of becoming important tools to increase the yield (Halmann, 1990). Growth regulators regulate cell division, cell enlargement, organ development, rate of growth, nutrient mobility, abscission, flowering, fruit set and development. Thus, it promotes rooting, lengthens the leaf area duration, suppress the photorespiration and unwanted growth, increase the harvest index, withstand stress and enhance the quality of produce. In this paper author's attempted to find out possible use of growth regulators in black pepper production in the light of available information.

GROWTH REGULATORS ON GROWTH OF BLACK PEPPER

Root

Black pepper is normally propagated by semi-hard wood cuttings. In Kerala, cuttings collected from terminal or runner shoots are planted in nursery during February-March and will be ready for field planting in June-July. The percentage of vines thus raised do not develop good root system and resulted in poor establishment in the field (Pillay et al, 1982). Leaf cutting with petiole and a bud quick dipped in IBA 2000 ppm (in 50% alcohol) gave 75 per cent rooting (Copper, 1955). The base of the cutting dipped in 2000 ppm of IBA for rooting (Grayer, 1957). Preplanting treatment of soft-wood cuttings with NAA 50 ppm increased the rooting compared to same dose of IAA and untreated control (Leite and Inforzato, 1966). IBA 200 ppm improved the rooting percentage of cuttings (Larcher, 1970). Two node cuttings dipped in IBA at 1000 ppm for 45 seconds produced highest root numbers (Pillay et al 1982). Three node cuttings treated with IBA 25 or 50 ppm gave better

root growth compared to IBA and NAA combinations (IBA 25 pm + NAA 50 ppm and IBA 50 ppm + NAA 25 ppm). (Hegde, 1983). Cuttings with nodal root treated with 2000 ppm IBA produced sigficantly higher root growth than control, whereas, cuttings without nodal roots produced highest rooting in IBA at 30,000 ppm (Zaubin, 1984). IBA at 200 ppm was the best for rooting of undefoliated single node cuttings (Suparman, 1988) but Shridhar and Singh (1990) observed that IBA at 1000 ppm gave better rooting. Keradix (commercial formulation containing IBA) 600 ppm was the best for root induction (Lizy, 1991). On contrary, Kamp (1969) reported that seradix 1 and seradix 2 (another commercial formulation) gave no significant response over control. Further he noticed slight losses in hormone treated cuttings when planted in field. Cuttings from runners (stolons), growing shoots (orthotrophs), hanging shoots (geotrophs) and laterals (plageotrophs) treated with IBA 10,000 ppm were superior with regard to rooting percentage and other root of growth parameters such a number, length, fresh weight and dry matter production of roots (Gigi et al 1993). Brief account of growth regulator on growth is given in Table 1.

Shoot

Growth regulators treatment, also influences the shoot growth and development cuttings dipped for 60 seconds in IBA at 1000 ppm resulted in stunted growth (Pillay et al 1982). Further they observed that shoot and leaf development was highest in control compared to dipping the cuttings in 1000 ppm IBA. Leaf number and shoot length were better with IBA at 1000 ppm compared to untreated control (Shridhar and Singh 1990). Treating the cuttings with hormones have been found to produce healthy rooted cuttings with good vigour and greater percentage of establishment in field (Nambiar and Pillay, 1978).

GROWTH REGULATORS ON REPRODUCTION OF BLACK PEPPER

In black pepper, carbon fixation and translocation must occur throughout the development of various organs particularly reproductive sinks. Both are interlinked and adverse effect on translocation would lead to incomplete development of sinks and hence lower sink capacity. For higher productivity these two processes must occur concurrently. Reduced translocation had led to poor sing development, lower sink capacity and consequent adverse effect on the source (Mathai, 1983). Growth regulators tested for hastening maturity, prevent spike shedding and enhance the yield are presented in Table 2.

Hastening Maturity

Different growth hormones were tested for hastening spike maturity by Salvi and Desai, (1989) and they found out no marked influence on hastening and the maturity except planofix 80 ppm reduced the harvesting duration from 47 days (in untreated control) to 20 days. However, dipping whole spike with GA 25 and 50 ppm, NAA 10 and 20 ppm and planotix 20 ppm increased the green berry weight significantly compared to control.

Prevent spike shedding

Spike shedding is one of the serious problems which limits the yield. The loss may be as high as 40 per cent. Shedding occurs in different stages of development. It may be due to genetic make up, nutritional imbalance, climatic and pest and disease problems (Pillary et al 1977 (a)). Spraying spikes with planofix at 90, 120 and 150 ppm did not reduce the spike shedding but it increased the berry size (Pillary et al 1977 (b)) Spraying 50 ppm IAA, 50 ppm planofix and 5 ppm, 2, 4-D reduced the spike shedding by 63.63, 57.2 and 35.34 per cent, respectively and also significantly increased the volume and weight of berries (Ceetha and Nair, 1990).

Yield

Planofix 20, 40 and 60 ppm spray increased the number of berries per spike and the yield, it was five times higher than control (Ponnuswami et al 1982). Fresh weight, dry weight and volume of the berries were significantly increased when the vines sprayed with subtoxic concentration (1 ppm) of 2, 4-D compared to untreated control (Hariha an and Unnikrishnan, 1985). Dipping or spraying of spike with growth regulator enhanced the green berry weight and also recorded best net returns from planofix 100 ppm, NAA 10 ppm and 2, 4-D 20 ppm (Salvi and Desai, 1989). Growth regulators improved the volume, weight of berries, 1000 berries weight and highest oleoresin (14.21%) was obtained with 50 ppm of NAA (Geetha and Nair, 1990). On contrary, no response was observed with 10, 15, 30, 60, 90, 120, 180 ppm of GA, IAA, NAA and 80, 100, 120 ppm of Ethrel at Sarawak, Malaysia (Anon, 1976, 1981).

CONCLUSION

Black pepper is a promising spice in spice trade. It's production has to be increased to meet the demand by AD 2000. Use of growth regulator for increasing the production is one of the options, apart from improved variety, fertilizer and pesticides. The above review shows that there is a possibility to use growth regulator in the black pepper cutivation and it enhances the growth and development, reduces the spike shedding and improves the yield parameters and final yield.

REFERENCES

1. ANONYMOUS, 1976. Annual report of the Research Branch, Department of Agriculture, Ministry of Agriculture and Community Development, Sarawak, Malaysia. pp. 146-149.

2. ANONYMOUS, 1981. Annual report of the Research Branch, Department of Agriculture, Ministry of Agriculture and Community Development. Sarawak, Malaysia. p. 115.

3. COPPER, St. G.C., 1955. A rapid method of propagating black pepper. Trop. Agric., Trinidad, **32** : 207-9.

4. GARAYAR, H and V.J. COBERA, 1957. Propagacion de la pimienta (propagation of pepper) Bol. trim. Exp. agropic P.C.E.A., Lima, **6** (2) : 25-28.

5. GEETHA, C.K. and P.C.S. NAIR, 1990. Effect of plant growth regulators and zinc on spike shedding and quaiity of pepper. Indian Cocoa, Arecanut and Spices J. **14**(1) : 10-12.

6. GIGI, F.M., ARAVINDAKSHAN, K. GOPIKUMAR and P.K. VALSALAKUMARI, 1993. Effect of growth substances on rooting of planting materials in black pepper. J. Tropical Agriculture, **31**(1) : 71-76.

7. HALMANN, M. 1990. Synthetic plant growth regulators. Adv. Agron. **43** : 47-105.

8. HARIHARAN, M. and K. UNNIKRISHNAN, 1985. Application of a low dose of 2, 4-D to promote fruit development in *piper nigrum* L., Seed Sci. and Technology. **13**(1) : 257-264.

9. HEGDE G.S. 1983. Effect of number of nodes on cuttings and growth regulators on rooting of (Panniyur-1) pepper (*P. nigrum* L.) vine. Thesis Abstract Haryana Agricultural Univ., India. **9**(1): 64.

10. KAMP. B.G., 1969. Preliminary studies in vegetative propagation of *Piper nigrum* L., Papua New Guinea Agric. J. **21** : 88-92.

11. LARCHER, J., 1970. La multiplication du poivrier et utilisation des hormones de bouturage (propagation of black pepper and the use of rooting hormone), Agron. trop., Paris. **25** : 745-764.

12. LEITE, J.R. and R. Inforzato, 1966. Enraizamento de pimenta do-reino (*Piper nigrum* L.) (The rooting of pepper cuttings) Bragantia, **25** Suppl., pp. VII-IX.

13. LIZY ANTONY, K., 1991. Effect of media and growth regulators on rapid multiplication of rooted cuttings of black pepper (*Piper nigrum* L.) cv. KS-14 M.Sc.(Hort). Thesis University of Allahabad, Allahabad, India.

14. LUCKWILL, L.C., 1985. In 'Growth regulators in Horticulture' (R. Menbenett and M.B. Jackson, eds.), Proc. Conf. British Plant Growth Regul. Group. **13**, pp. 57-61.

15. MATHAI, C.K., 1983. Growth and yield analysis in black pepper varieties (*Piper nigrum*) Under different light conditions. Ph.D. Thesis, University of Agricultural Sciences, Bangalore, India. p. 206.

16. Nambiar, P.K.V. and V.S. PILLAI, 1978. Pepper Research Station, Panniyur. Memoirs of a quarter century. Silver Jubilee Souvenir PRS Panniyur. The Directorate of Extension Education, Kerala Agril. Univ. pp. 29-31.

17. PILLAY, V.S., S. SASIKUMAR and P.K.V. NAMBIAR. 1977 (a). A note on preliminary observation of spike shedding in pepper. Arecanut and Spices Bulletin, **3** (4) : 93-94.

18. PILLAY V.S., S. SASIKUMAR and P.K.V. NAMBIAR, 1977 (b). Studies on the effect of planofix application on pepper (*Piper nigrum* L.), Agric. Res. J. Kerala, **15** (1) : 56-58.

19. PILLAY V.S., A.B. ALI and K.C. CHANDER, 1982. Effect of 3 - indole butyric acid on root initiation and development in stem cuttings of pepper (*Piper nigrum* L.) Indian Cocoa, recanut and Spices J. **6** (1) : 7-9.

20. PONNUSWAMI, V., I. IRULAPPAN, G. DHARMARAJ and E. VADIVELU, 1980. Effect of growth regulators on berry set, berry development and yield in pepper (*P. nigrum* L.) South Indian Hort. **28** : 225-226.

21. SALVI, B.R. and A.G. DESAI, 1989. Effect of application of different growth regulators on maturity and yield of black pepper. J. of Plantation Crops. **17** (1) : 44-49.

22. SHRIDHAR and SHYAM SINGH, 1990. Effect of number of nodes and indole butyric acid (2 BA) in rooting of black pepper cuttings under Andaman conditions. Indian Cocoa, Arecanut and Spices J. **14** (1) : 33.

23. SUPARMAN, V. and R. ZAUBIN, 1988. Effect of defoliation, IBA and Saccharose on root growth of black pepper cuttings. Industrial crops Res. J. **1** (1) : 54-8. (Indonesia).

24. ZAUBIN, R. 1984. (Effect of IBA and planting method on the growth of pepper). Pengaruh Konsentras IBA dan Caramenanam terhadap perutumbuhan akar setak lada Pemberitaan, Penelitian Tanaman Industri. **8** (49) : 55-9 (Indonesia).

TABLE I

Growth regulators tested on black pepper growth

Growth	Growth regulator	Concentration (ppm)	Response	Reference
1. Root	IBA	2000	Positive, 75% rooting achieved.	Copper, 1955
		200	Positive, significantly improved the rooting.	Larcher, 1970
		1000	Positive, Higher number of cuttings rooted.	Pillay et al. 1982
		25, 50 500, 1000, 1500, 2000	Positive, better rooting.	Hegde, 1983
		5000, 10,000, 20,000, 30,000, 40,000	Positive, better root growth.	Zaubin, 1984
		100, 200	Positive. 82·4% at 200 ppm.	Suparman 1984
		1000, 2000, 3000, 4000	Positive 80% rooting with 1000 ppm.	Shridhar and Singh, 1990
		200,400,600	Positive	Lizy, 1991
		500,1000,1500	Positive	Gigi, 1993
	IAA	500,1000,1500	Positive	Gigi, 1993
	IAA+IBA	500,1000,1500	Positive	Gigi, 1993
	NAA	50	Positive, 62·5% rooting	Leite & Inforzato, 1966
		200,400,600	Positive	Lizy, 1991
	Keradix	200,400,600	Positive	Lizy, 1991
	Seradix, 1	—	No response	Kamp, 1969
	Seradix, 2			
2. Shoot	IBA	1000	No response	Pillay et al. 1982
		1000, 2000, 3,000, 4,000	Positive	Shridhar & Singh, 1990

TABLE 2

Effect of growth regulators on yield components and yield of black pepper

Purpose	Growth regulator	Concentration (ppm)	Response	Reference
Hastening maturity	GA	25, 50, 75	Positive	
	NAA	10, 20, 30	Planofix	Salvi & Desai, 1989
	Ethophon	250, 500, 750	80 ppm, reduced the	
	2, 4-D	10, 20, 30	harvesting duration from	
	planofix	40, 60, 80, 100	47 days (in control) to 20 days	
Prevent spike shedding	Planofix	90, 120, 150	No response	Pillay et al 1951(b)
	IAA	50, 100, 150	Positive, reduced the	
	Planofix	50, 100, 150	spike shedding by	Geetha & Nair, 1990
	2, 4-D	5, 10, 150	35-64%	
	NAA	50, 100, 150		
	Vardhak	50, 100, 150		
Yield	GA	10, 15, 30, 60	No response	Anon, 1976
	NAA	90, 120, 180		
	IAA			
	Ethrel	80, 100, 120	No response	Anon, 1981
	NAA	12·5, 25, 50	Positive, 5 times	Ponnuswamy et al 1982
	Planofix	20, 40, 60	over Control	
	2, 4-D	2·5, 5, 10		
	2, 4-D	1	Positive, increases the weight and volume of berries	Hariharan & Unnikrishnan, 1985

COCOA TRADERS MOVE AWAY FROM TRADING

PHYSICAL cocoa trading was at a low ebb this week as the focus moved away from the market for an annual industry meeting in London.

Trading has been slight anyhow in recent weeks, traders said, Ghana appears to have ended its marketing for now while there are indications Ivory Coast's mid crop beans are on average below exportable standards.

This week cocoa market buyers and sellers gathered in London for the annual cocoa dinner.

"There is every reason for declaring this week a non business week," a trader said.

Ivory Coast was said to have been last traded at 47 under July and in-store cocoa was valued at 20 under July.

Ghana was last valued at five to 15 premium to futures prices through to July/September delivery.

Traders are assessing the quality of Ivory Coast's mid crop.

Crop forecasters predict a mid-crop of 120-140,000 tonne compared with 180-200,000 tonne last year.

But up-country buyers said earlier this week that the bean count is running below the exportable count of 110 per 100 grammes. Some London traders said only 50,000 tonne of the crop might be exportable.

"By and large the remaining beans will have to hang over to be blended into the main crop," one trader said.

—Courtesy : Economic times, 5-5-95