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Effect of different methods of white pepper paration on the chemical and aroma quality in selected cultivars of Piper nigrum L.

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ABSTRACT

epper prepared by three different methods viz., retting, steaming/boiling and rolling and ter treatment from three popular cultivars of Piper nigrum L. viz., Panniyur1, Karimu o ammunda were compared. The effect of these treatments on the chemical quality constitu s oleores in and essential oil and on aroma bearing constituents of the essential oil has bee ere was a reduction in the essenttial oil content of white pepper by all the metho from the ers. Levels of certain chemical constituents of the oil like pinene and caryophyll ne which lavour to the pepper oil has shown remarkable decline, while constituents like erpineol, l and phellandrene are either not affected or increased in white pepper prepared by steaming As this method requires only green pepper, farmers need not delay the harvest for r d berries used traditionally for white pepper preparation.

INTRODUCTION

epper from *Piper nigrum* L. is gaining demand in Indian and International hite pepper is obtained by drying fully pper after the removal of the pulpy is is done traditionally by using the nes. The despiked pepper if kept in egenerates the pericarp and the decor- ner is dried to obtain white pepper. ethod requires ripe red berries which mer in great difficulty as he has to arvest which may lead to the loss of bird attack, fruit fall etc. Some enterprising growers handpick the berries and suspend in a downstream of water and remove it after 24 to 48 hours. Both the above methods have the disadvantage of white pepper developing an obnoxious odour due to microbial load. The stringent export regulations (Vajdi and Pereira, 1973) requires highest quality for white pepper and hence there is a necessity to improve upon the existing methods of white pepper preparation. As a modification, CFTRI, Mysore has developed the boiling/steaming and rolling method to prepare white pepper (Pruthi, 1976). In this method, the fully matured pepper while still green is steam cooked or boiled to loosen the

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pericarp and also to reduce the microbial load. This has a disadvantage that it imparts a buff colour to the product due to the gelatinisation of starch while boiling. As white pepper is widely used in the middle east and western countries, mainly for table purpose the undesirable odour makes it unacceptable. An experiment was undertaken with three popular cultivars of *Piper nigrum* L. to study the impact of various methods of white pepper preparation on the chemical and aroma quality of the pepper oil.

MATERIAL AND METHODS

Popular pepper cultivars viz., Paniyour1, Karimunda and Arakulammunda from the experimental farm of NRCS at Peruvannamuzhi were used for the study. Pepper was harvested at the correct maturity stage and 3 lots each weighing 15 kg were separated for processing. The correct stage of maturity was adjudged by the presence of ripe berries in some of the spikes at the time of harvest. Each lot was again divided into three subplots and taken as three replications of each treatment. The following three different methods were used for white pepper preparation.

1. Retting method

The sample was kept in still water and allowed to soak in water for ten days. The water in the container was changed every alternate day leaving small residual quantity to allow limited microbial oxidation and prevent any obnoxious odour getting imparted to pepper. After ten days the water was drained out and the berries were rolled to remove the outer pericarp.

2. Steaming/boiling and rolling

The pepper was boiled or steam cooked for 13 min and cooled and rolled in running water to remove the outer skin.

3. Running water treatment

The despiked green pepper was filled in a gunny bag and kept under running water for 24 hr and later the outer skin was removed.

Decorticated pepper from the above treatments was sun dried to a final moisture level of 12%. Twenty seven samples resulting from 3 cultivars, 3 methods of white pepper preparation and 3 replications were evaluated for chemical and aroma quality and are compared with the black pepper of these cultivars.

For evaluating the chemical quality of the white pepper, its piperine, oleoresin and essential oil contents were determined. Piperine in the dried and comminuted sample was determined by spectrophotometric method (I.S.I., 1984). Oleoresin was extracted by cold acetone percolation and subsequent removal of solvent by vacuum distillation (A.O.A.C., 1975). The oleoresin was determined by gravimetry. Essential oil was extracted by hydro distillation of preweighed quantity of powdered pepper using clevenger trap (lighter than water type) and was computed as volume per weight (A.O.A.C., 1975).

Extracted essential oil was subjected to gas chromatography in Hewlett packard Gas chromatograph model 5730 A interfaced with 3390 HP integrator. Emerging peaks were identified by their relative retention times obtained by GC of authentic standards (Aldrich Chemicala, U.S.A.) under similar conditions in which the pepper oil was evaluated.

RESULTS AND DISCUSSION

Chemical quality of white pepper as influenced by retting (T2), steaming and rolling

popular cultivars i.e., Panniyur-1, Karimunda and Arakulammunda are presented in Table 1. Among the treatments the piperine level was affected more in steaming and rolling compard to other treatments. When compared to the piperine level of black pepper of similar moisture (T1) level the difference between the treatments was not significant. There was no significant difference between the treatments in both oleoresin and essential oil levels in all the three varieties. There is reduction in the essential oil level in white pepper from all the three methods compared to that of black pepper. The reduction in essential oil level between black pepper and white pepper could be accounted to the removal of skin as some of the essential oil cells are located in the mesocarp. The difference in depletionobserved in the three varieties could be accounted to the difference in the sensitivity of the variety towards the treatment.

Aroma quality expressed as percentage content of aroma bearing compounds is presented in Table 2. Hydrocarbons like α and β-Pinenes, Myrcene, Cymene and Phellandrene, alcohols like α terpineol, Nerolidol and Nerol and sesquiterpenoids like caryophyllene are some of the important chemical constituents of pepper oil (Guenther, 1972). Pangborn et al. (1970) have fractionated the aroma of pepper oil into groups of compounds which range from piney, lemony, rubbery, woody to peppery, spicy, sweety, musty, unpleasant, medicinal, acidic and phenolic. The terpenes contributes to topnotes while the oxygenated fractions contribute to the characteristic odour of the volatile oil of the pepper (Govindarajan, 1977). The pepper oil with high pinenes have undesirable terpentine like odour and those with high sesquiterpenes like caryophyllene have pleasing odours (Pangborn and Jennings, 1970).

In steaming and rolling method, there is a reduction in pinenes in panniyur -1 and Arakulammunda white pepper while the effect is marginal in Karimunda. The level is slightly higher in retting in Panniyur-1 and Karimunda with a marginal effect in Arakulammunda. In Panniyur-1 and Arakulammunda, Phellandrene level was reduced by all treatments while in Karimunda this was translocated to the endocarp by steaming and rolling. The increase in α -terpineol shows that oil quality is improved by the removal of the skin.

Removal of skin has markedly affected the caryophyllene level in all the treatments. The extent varied between the cultivars and the effect was highest in Karimunda. In Panniyur-1 and Karimunda the steaming and rolling reduced the caryophyllene level to the maximum compared to Arakulammunda where the effect between treatments is marginal.

In summary, steaming and rolling method of white pepper preparation though reduced the piperine content marginally, it also has reduced the pinene and caryophyllene levels which impart an off flavour to pepper oil while it enhanced the α-terpineol, safrol and nerol levels, thus improving the aroma quality. The flavour of pepper oil by the other two methods viz., retting and running water treatment is also not poor. However, considering the efficacy and easiness of white pepper preparation by the steaming and rolling of green pepper over the other two treatments it deserves a higher acceptance. It also has an additional advantage that the farmer need not wait for delayed harvest

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Table 1. Chemical quality of white pepper as effected by different methods of processing in popular black pepper cultivars

Variety		% Piperine	%Oleoresin	% Essen
Panniyur–1	T1	3.72	8.10	
	T2	3.24	7.39	
	T3	3.00	7.39	
	T4	3.51	7.23	
Karimunda	T1	3.86	7.80	
	T2	2.56	6.56	
	T3	2.17	5.49	
	T4	2.54	6.63	
Arakulammunda	T1	3.33	10.00	
	T2	2.99	8.07	
	T3	2.57	8.21	
	T4	2.96	8.07	

T1 = Black pepper; T2 = Retting; T3 = Steaming and Rolling; T4 = Running water.

Aroma quality of white pepper as effected by different methods of processing of green pepper
ular cultivars*

		Pinene	Phel-landrene	Carveol	Nerol	1 - Ter-pineol	Dihydro Carveol	Safrole	Caryo Phyle
		2.12	2.5	2.56	2.78	3.83	4.6	4.57	6.68
	T1	4.90	13.34	13.29	29.89	0.24	0.24	0.12	28.61
	T2	5.05	12.80	12.80	30.41	0.78	0.18	0.21	23.89
	T3	4.69	11.41	11.65	25.83	0.46	0.08	0.68	18.57
	T4	4.48	12.75	11.09	31.23	0.40	0.03	0.44	23.23
	T1	4.22	10.45	13.86	22.60	0.31	0.21	0.21	25.75
	T2	4.65	10.05	19.17	19.25	0.52	0.30	0.42	17.60
	T3	6.20	12.41	11.78	34.40	0.40	0.14	0.22	15.53
	T4	4.42	11.16	14.49	17.55	0.48	0.06	0.08	15.13
nda	T1	5.11	14.27	16.19	24.27	0.53	0.50	0.50	28.31
	T2	5.05	10.67	21.96	23.48	0.96	0.14	0.21	24.07
	T3	4.19	8.85	23.52	25.39	0.44	0.32	0.32	26.45
	T4	5.22	12.30	23.38	12.59	0.43	0.10	0.20	23.10

pper; T2 = Retting; T3 = Steaming & Rolling; T4 = Running water. rt = Retention time.

three replications.