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VARIATION IN PROCESSING QUALITIES OF CASHEW NUTS IN RELATION TO DAMAGE BY INSECT PESTS

S. Divya Raman, P. B. Pushpalatha and M. C. Narayanankutty
Kerala Agricultural University, KAU-P.O., Thrissur 680 656, India

Abstract: The study revealed that pest attack by tea mosquito bug and thrips on cashew not only caused considerable reduction in the size of nuts and kernels but also resulted in low white whole recovery, more kernel pieces and rejects. The sugars, carbohydrates and proteins were low in kernels of attacked nuts, while the fat content did not vary significantly.

Key words: Cashew nut, pest attack, tea mosquito bug, thrips

INTRODUCTION

The cashew is being attacked by more than fifty species of insect pests throughout the world (Beccari and Gerini, 1968). It is estimated that more than 50% of the crop is lost annually due to pests and diseases in cashew (Haribabu *et al.*, 1983). Many are attacking the plants as a whole and those infecting the nuts are less in number. Even though the extent of crop loss and damage incurred by various pests on floral parts and immature nuts are studied well, their effect on kernel quality, the ultimate produce remains to be an unstudied line. In the present study, two major pests of cashew viz., tea mosquito bug and thrips were found to inflict substantial loss to the nuts. Hence the quality deterioration of nuts due to damage by these two pests were studied.

MATERIALS AND METHODS

The present study was undertaken in the Department of Processing Technology, College of Horticulture, Vellanikkara, Thrissur. Nuts of three different varieties viz., Madakkathra-1 (V_1), Kanaka (V_2) and Priyanka (V_3) collected from CRS, Madakkathra were observed for the symptoms of pest attack during the fruiting season (1999-2000). The nuts of these three varieties attacked by the two pests, viz., tea-mosquito bug (P_1) and thrips (P_2) were collected separately for quality evaluation. The un-infested nuts of these varieties were also analyzed and treated as control (P_3). Observations were recorded on physico-chemical attributes of nuts and kernels.

Physical characters of nuts and kernels

The physical characters of nuts recorded were weight (g), length (cm), breadth (cm) and shelling percentage. Shelling percentage was determined by subjecting the samples to shelling under laboratory conditions. For this, the methodology standardized in the Department of Processing Technology was used. Nut samples weighing 250 g were taken in the autoclave and cooked at 15 psi and 121°C, for 30 minutes. These were taken out, hand shelled and the shelling percentage was worked out.

After deshelling the nuts, kernels were peeled and the total weight of the shells and testa were taken and expressed as percentage husk rejects for each sample. The average kernel weight was expressed in grammes, and the kernel grade was assigned to the different samples, based on number of kernels per pound. The white whole kernels, kernel pieces and kernel rejects in each sample were weighed and expressed in percentage.

Biochemical characters of kernels

The different samples after steaming were deshelled and oven dried for 48 hours for easy removal of the testa. After peeling, the kernels were further dried and powdered. The powdered flour was used for the estimation of fats, carbohydrates, proteins and sugars as per the procedure given by Sadasivam and Manickam (1996).

The data on physical and biochemical characters of the pest infested and un-infested nut samples of all the three varieties were subjected to factorial CRD analysis, as proposed by Panse and Sukhatme (1976).

RESULTS AND DISCUSSION

Physical characters of nuts and kernels

The physical characters of the nuts and kernels both pest-infested and un-infested nuts of the three varieties analyzed are presented in Tables 1 and 2. The physical characters of the nuts viz. length, breadth, weight and kernel weight recorded

Table 1. Effect of tea mosquito bug and thrips attack on physical characters of cashew nuts of different varieties

Pest attack	Physical characters of nuts				
	Length, cm	Breadth, cm	Weight, g	Shelling %	Husk rejects, %
P1	3.67	2.32	6.33	22.08	77.94
P2	3.69	2.28	6.39	22.77	77.24
P3	4.03	2.46	7.33	27.67	72.33
CD (0.05)	0.30	0.14	0.34	0.86	0.44
SEm±	0.10	0.05	0.11	0.29	0.15
Pest attack x Varieties					
P1V1	3.43	2.23	5.06	21.03	79.00
P1V2	3.14	2.22	5.24	22.60	77.40
P1V3	4.43	2.50	8.69	22.60	77.43
P2V1	3.38	2.16	4.91	22.00	78.02
P2V2	3.20	2.11	5.15	23.60	76.40
P2V3	4.50	2.55	9.11	22.70	77.30
P3V1	3.85	2.36	5.60	29.00	71.00
P3V2	3.50	2.32	5.85	28.00	72.00
P3V3	4.73	2.70	10.53	26.02	74.00
CD 0.05)	NS	NS	0.59	1.49	0.77
SEm±	0.17	0.08	0.20	0.50	0.26

P_1 = Tea mosquito bug attack, P_2 = Thrips attack, P_3 = un-infested nuts; V_1= Madakkathara-1, V_2 = Kanaka, V_3 = Priyanka

Table 2. Effect of tea mosquito bug and thrips attack on physical characters of cashew kernels of different varieties

Pest attack	Physical characters of kernels				
	Weight, g	White wholes, %	Pieces, %	Rejects, %	Kernel grade
P1	1.68	70.06	16.83	13.15	W 280
P2	1.75	74.53	14.36	11.12	W 280
P3	2.05	88.01	7.84	1.72	W 240
CD (0.05)	0.22	1.17	0.77	0.50	
SEm±	0.07	0.39	0.26	0.17	
Pest attack x varieties					
P1V1	1.40	72.00	15.69	12.39	W 320
P1V2	1.40	68.63	16.98	14.40	W 320
P1V3	2.24	69.53	17.83	12.67	W 210
P2V1	1.42	75.80	13.83	10.33	W 320
P2V2	1.51	70.80	16.07	13.23	W 320
P2V3	2.31	77.00	13.17	9.81	W210
P3V1	1.81	90.00	5.24	2.05	W 280
P3V2	1.70	86.03	8.03	2.10	W 280
P3V3	2.63	88.00	10.27	1.00	W 180
CD (0.05)	NS	2.02	1.34	0.87	
SEm±	0.13	0.68	0.45	0.29	

P_1 = Tea mosquito bug attack, P_2 = Thrips attack, P_3 = un-infested nuts; V_1 = Madakkathara-1, V_2 = Kanaka, V_3 = Priyanka

significant reduction in the tea mosquito and thrips attacked nuts, compared to the un-infested nuts in all the three varieties studied.

The pest infested nuts on an average had low shelling percentage (22.08 and 22.77 respectively for the tea mosquito and thrips infested nuts), while the un-infested nuts recorded a higher shelling percentage of 27.67. The same was the case when each variety was considered individually. The tea mosquito attack on the immature nuts results in death of infested parts of the nuts. Devasahayam and Nair (1986) reported that pest infestation causes lesions on fruits which appear as brownish black circular scabby spots. This results in an unhealthy growth and development of nuts which hampers the normal cell elongation, multiplication and smooth translocation, as well as accumulation of metabolites in cells. The effect is seen in the case of thrips attack as well.

The weight of kernels from infested nuts was significantly low compared to that from un-infested nuts. Hariharan and Unnikrishnan (1984) recorded low protein level in cotyledonary cells at early phases of nut development. The content was found increasing up to 40 days after nut set. The pest attack on nuts might have limited dry matter accumulation in kernels during development stage. Processing of pest-attacked nuts resulted in the recovery of less white wholes, more kernel pieces and rejects as against high white whole recovery, less kernel pieces and rejects from the un-infested samples.

The same was the case when all the three varieties were considered separately. The pest attack might have thoroughly shattered the normal physiological development of kernels. They are more prone to become rancid due to fat degradation and protein coagulation. As such, the deteriorated kernels had to be rejected. Nagaraja (1998) reported that any bruise makes the fats liable to become rancid, and as such the integrity of kernels are lost.

Due to less kernel weight, the pest-infested samples recorded an average kernel grade of

Table 3. Effect of tea mosquito bug and thrips attack on biochemical constituents of kernels of different cashew varieties

Pest attack	Biochemical constituents of kernels			
	Sugar	Carbohydrates	Protein	Fat
	%			
P1	8.31	13.36	11.52	46.89
P2	8.62	13.10	12.96	46.79
P3	9.52	18.89	19.95	45.90
CD (0.05)	0.57	0.72	0.59	NS
SEm±	0.19	0.24	0.20	0.29
Pest attack x varieties				
PIV1	8.67	14.34	10.05	46.95
P1V2	7.93	13.16	12.14	48.10
P1V3	8.35	12.57	12.37	45.62
P2V1	8.59	13.65	13.71	47.59
P2V2	7.82	13.27	13.74	47.05
P2V3	9.44	12.38	11.43	45.72
P3V1	8.46	19.30	18.72	46.10
P3V2	8.30	19.70	19.10	48.10
P3V3	11.80	17.68	22.03	43.50
CD 0.05)	0.98	NS	1.01	1.49
SEm±	0.33	0.42	0.34	0.50

P_1 = Tea mosquito bug attack, P_2 = Thrips attack, P_3 = non infested nuts: V_1 = Madakkathara-1, V_2 = Kanaka, V_3 = Priyanka

W280, whereas the kernels from un-infested nuts were graded under W240. In varieties Madakkathra-1 and Kanaka, the kernels from pest-attacked nuts were graded under W320, while the kernels from un-infested nuts had higher grade, W280. In the variety Priyanka, the kernels of pest-attacked nuts were graded under W210, whereas the kernels from the un-infested nuts recorded the grade W180.

Biochemical characters of kernels

The biochemical characters of kernels of both pest infested and un-infested nuts of the three varieties analyzed are given in Table 3. Significantly higher level of sugar content (9.52%) was observed in un-infested nuts than tea mosquito (8.31%) and thrips (8.62%) infested nuts. This was true when all the three varieties were considered individually.

The pest attack on the nuts resulted in significant reduction in the carbohydrate and protein content of the kernels in all the three varieties studied (Table 3). The average carbohydrate content was the lowest in the kernels from thrips infested nuts (13.10%), compared to a very high content (18.89%) in the kernels of un-infested nuts. The kernels from tea mosquito infested nuts recorded the lowest average protein content of 11.52% compared to 19.95% in the kernels from un-infested nuts. No significant difference in the fat content was observed due to tea mosquito bug or thrips attack in cashew kernels. In varieties Madakkathra-1 and Priyanka, the fat content was less in kernels from un-infested nuts (46.1% and 43.5% respectively). In the variety Kanaka, the kernels from tea mosquito attacked nuts recorded a high fat content of 48.10%.

The pest attack affects the natural pathway of synthesis, translocation and accumulation of different metabolites. This might have resulted in reduced amount of primary metabolites viz., carbohydrates, sugars and proteins in kernels of infested nuts. The pest attack also might be hampering the natural pathway of conversion of carbohydrates to proteins. Low protein content in cashew kernels is not desirable from health point of view and such kernels are not fit for consumption. Hence, not only the appearance, but also the quality of kernels of pest-infested nuts are found reduced, both in terms of nutrients and palatability.

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REFERENCES

Beccari, F. and Gerini, V. 1968. Contribution to knowledge of the insect fauna of *Anacardium occidentale* in Tanzania and in the world. *Riv. Agric. Subtrop. Trop.* 62(4-6): 129-34

Devasahayam, S and Nair, C. P. R. 1986. Tea mosquito bug on cashew in India. *J. Plantation Crops* 14:1-10

Haribabu, R. S., Rath, S. and Rajput, C. B. S. 1983. Insect pests of cashew in India and their control. *Pesticides* 17(4): 8-16

Hariharan, M and Unnikrishnan, K. 1984. Changes in free amino acids and total protein contents in developing kernels of cashew. *Indian j. agric. Sci.* 54 (2): 113-116

Nagaraja, K. V. 1998. Quality of cashew kernels in relation to export. *The Cashew* 12(3): 143-148

Panse, V. G. and Sukhatme, P. V. 1976. *Statistical Methods for Agricultural Workers.* Indian Council of Agricultural Research, New Delhi, p.360

Sadasivam, S. and Manickam, A. 1996. Fats and carbohydrates. *Biochemical Methods for Agricultural Sciences.* New Age International (P) Limited, pp.8-23