

## Short Communication

# Nutritional changes in stored chickpea, *Cicer arietinum* in relation to bruchid damage

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**Chemical composition of chickpea seeds treated with three plants extracts namely, *Azadirachta indica* (kernels), *Allium sativum* (bulb) and *Piper nigrum* (seeds) after infestation with three pairs of cowpea weevil, *Callosobruchus maculatus*, had been evaluated after one month. The seeds were also taken for analysis of nutritional changes from culture infested with *C. maculatus* after one and six months of infection. An increase in total ash and protein content has been noticed while crude fat (ether extract) and total carbohydrate decreases with increased weevilisation in chickpea (*Cicer arietinum*) seeds. No significant change in nutritional component has been found in seeds treated with petroleum ether extract of neem kernels, garlic bulb and black pepper seeds, however, statistical analysis showed significant difference in biochemical components of infected and normal seeds.**

**Key words:** Bruchid, chickpea, plant extracts and nutritional changes.

## INTRODUCTION

Pulses constitute one of the important sources of protein in Indian diet. However, pulses are invariably infested with beetle and weevil in fields as well as at storage time (Adugna, 2006). Due to infestation, seeds undergo biochemical alterations which results in the loss of various constituents of the seeds. *C. maculatus* is one of the major pests of pulses and chickpea seeds suffer from quantitative and qualitative losses due to attack of this bruchid (Modgil and Mehta, 1997; Adugna et al., 2003). Therefore, the present investigation was undertaken with a view to find out the quantitative losses caused by feeding of *C. maculatus* over two periods of storage of chickpea seeds. Seeds treated with three plant extracts were also analyzed after one month of infection.

## MATERIALS AND METHODS

The seeds from the continuous culture of *C. maculatus* were taken after one month and six months of infection. 20 g of healthy

chickpea seeds were treated with 2% concentration of three plant extracts, namely, *A. indica* (neem) kernel, *P. nigrum* (black pepper) seed and *A. sativum* (garlic) bulb, at 20 ml/kg seeds. These plant extracts were prepared in petroleum ether solvent in the soxhlet apparatus. The extracts were prepared in 1:5 ratio and treated as stock. Two replicates and one control were also placed. Three pairs of 3 days old adults were released in each jar. These jars were kept at  $27\pm 1^\circ\text{C}$  temperature and 75% relative humidity. The test insects were taken out after three days of release and the jars were kept for one month. The adult emerged from each replicate and control was removed from the day they started emergence till the completion of first generation. Seeds from each jar were taken for analysis. All the seeds were dissected for the removal of excrement material. Seeds were then dried at  $60^\circ\text{C}$  for an hour to bring the moisture level to equilibrium and powder of the grains were made with the help of pestle and mortar.

The observation on qualitative losses such as crude protein, crude fat (ether extract) and ash content were recorded according to "Association of Official Analytical Chemists" (1985).

## RESULTS

Nutritional changes in the seeds treated with extract of neem kernel, black pepper seed and garlic bulb were not significant in comparison with normal seeds as these extracts were found to be effective against *C.*

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**Table 1.** Nutritional alteration in chickpea seeds by *Callosobruchus maculatus*.

	Percent total ash	Percent crude fat	Percent total nitrogen	Percent crude protein	Percent total carbohydrate
Normal seeds	4.02	5.40	3.48	21.74	68.84
<b>Seeds treated with extract</b>					
Neem kernel	4.25	5.13	3.55	22.19	68.44
Black pepper seed	4.10	5.21	3.53	22.08	68.61
Garlic bulb	4.50	5.00	4.02	25.12	65.38
Infected control	5.03	4.77	4.53	28.33	61.87
<b>Seeds taken from culture</b>					
One month infected	7.83	4.48	4.78	29.87	57.82
Six month infected	8.96	3.93	6.84	42.72	44.39
Sem ±	0.26	0.07	0.02	0.10	0.28
CD at 5%	0.87	0.23	0.07	0.33	0.93

Sem (standard error mean).

*maculatus* (Table 1). However, infected control showed some nutritional changes in comparison with normal chickpea seeds. Significant differences in biochemical components of six month infected seeds and normal grains have been evaluated. The total ash of chickpea seeds increased significantly during storage. 7.83 and 8.96% total ash has been reported for one month and six month infected seeds, while normal seeds shows only 4.02% total ash (Table 1). Increase in protein content has been reported in more weevilled seeds. The seeds treated with extract of neem, black pepper and garlic showed 22.19, 22.08 and 25.12% crude protein, when compared with infected control seeds (28.33) and normal seeds (21.74%). Rapid increase in protein percentage was observed in seeds during storage and it was 29.87 and 42.72% for one month and six month infected seeds respectively. The crude fat (ether extract) decreased significantly. It was found to be 5.13, 5.21 and 5% for seeds treated with extract of neem kernel, black pepper seeds and garlic bulb respectively as compared with infected control (4.77%). One and six month infected seeds showed 4.48% and 3.93% crude fat and exhibit significant difference with normal seeds (5.40%). Decrease in total carbohydrate has also been reported in the present investigation. It was observed to be 68.84% for normal seeds. More or less similar percent carbohydrate was observed for seeds treated with extracts (Table 1).

The analysis of one month (57.82%) and six month (44.39%) infected seeds showed gradual decrease in carbohydrate, when compared with normal seeds. Thus it was observed that total ash and protein content increased while total carbohydrate and crude fat decreased with more weevilisation.

## DISCUSSION

Gupta et al. (1984), while conducting similar types of studies also concluded that total ash and protein increased in infected seeds of black gram and similar reports has also been shown for pigeon pea by Srivastava et al. (1988a). Contrary, Khairnar et al. (1996) found significant decrease in crude protein content of pigeon pea seeds during storage. Decrease in fat content has been reported in recent studies. This contention holds true with the observation of Srivastava (1988b). Khairnar et al. (1966) also reported decrease in crude fat continuously after 3, 4 and 5 months of storage due to feeding of *C. chinensis*. Thus these findings were also in the support of the present observations. Srivastava et al. (1988a, b) reported decrease in total carbohydrate which was also in accordance with the present study. In the present studies increase in ash, crude protein and non protein nitrogen has been reported and these findings were also supported by Modgil and Mehta (1995).

## REFERENCES

- Adugna H, Dangnew G, Biniam Z, Biniam A (2003). On farm storages studies in Eritrea. Dry land coordination group DCG report No. 28.2003.
- Adugna H (2006). On farm storages studies in Eritrea. Afr. J. Biotechnol., 5(17):1537-1544
- Association of Official Analytical Chemists (1985). Official methods of analysis, Washington.
- Gupta S, Srivastava JL, Singal SK (1984). Chemical and nutritional changes in black gram during storage caused by the attack of pulse beetle *C. maculatus*. J. Fd. Sci. Tech., 21 (1): 250-252.
- Khairnar GP, Adsule VM, Thakur SC (1996). Quantitative and qualitative losses caused by *C. chinensis* in pigeon pea over

different period of storage. *Seed Res.*, 24(1): 42-44.

Modgil R, Mehta U (1995). Effect of insect infestation (*C.chinesis*) on the physicochemical properties of Bengal gram (*C.arietium*) during storage. *Leg. Res.* 18(3-4): 157-161.

Modgil R, Mehta U (1997). Effect of infestation (*C.chinesis*) of chickpeas on biological utilization of proteins. *Naharung*, 41(4): 236-238.

Srivastava S, Mishra DP, Khare BP (1988a). Effect of insect infestation on biochemical composition of pigeon pea seeds stored in mud bins. *J.Fd. Sci. Tech.*, 26(2): 120-125.

Srivastava S, Mishra DP, Khare BP (1988b). Biochemical composition of stored pigeon pea in relation to bruchid damage. *J. Fd. Sci. Tech.* 25(6): 375-376.