J. Mycopathol. Res. **32** (1) : 1-5 (1994) *Printed in India*

Poultry feed preservation from fungal infection by cinnamon oil

P. S. MUKHERJEE AND B. NANDI
Mycology and Plant Pathology Laboratory,
Department of Botany, Burdwan University
Burdwan 713104

The possibility of application of essential oil cinnamon as feed preservative was studied. In storage, moisture content and the number of fungal colonies increased in untreated but showed evident decrease in cinnamon treated feed. Rate of feed consumptions and increase in body weights ware slightly higher at lower level of cinnamon treatment. Chicks showed no sign of illness or any morphological abnormality. Thus, cinnamon proved to be an effective feed preservative under tropical condition.

Key Words : Essential oil cinnamon, Poultry feed, Chick, Antifungal activity, Storage fungi, Feed consumption, Body weight

INTRODUCTION

Volatile fungitoxic compounds were reported to possess tremendous possibility as seed and feed preservative by inhibiting growth of storage fungi (Nandi, 1990). Several essential oils of plant origin were also reported to possess antimicrobial properties showing high fungitoxicity and low phytotoxicity (Deshmukh *et al.*, 1986 ; Onawunmi, 1989 ; Chaumont and Bardey, 1989 ; Farag *et al*, 1989 ; Mukherjee *et al* , 1992). A number of essential oils are now considered to have great potentiality as seed preservatives (Nigam and Rao, 1977 ; Mallick and Nandi, 1982 ; Misra and Batra, 1987). In the present study, efficacy of cinnamon oil as preservative of poultry feed against fungal infection and its acceptability to chicks have been worked out.

MATERIALS AND METHODS

Two levels of cinnamon oil (0.1% and 0.2% w/v), which showed effective seed preservative property in an earlier experiment (unpubl.), were used for treatment of poultry feed "starter mash" (corn, milo, oil cakes, rice bran, fish meal and vitamins) procured from Sen Feed Co. Burdwan (W. B.).

Two weeks old vaccinated chicks (RIR) collected from West Bengal Government Poultry Farm, Burdwan, were used as experimental animals.

The examination of food conditions, treatment procedure of cinnamon oil on poultry feed and the feeding experiment on the chicks were done following the method of Paster (1979) as modified by Bose *et al.* (1986).

RESULTS

Moisture content

Moisture content of poultry feed increased from initial 11% to 11.5% after 30 days in untreated feed but remained more or less unchanged in treated sets

Fungal Population

At the onset of storage, the extent of infection of the feed by different fungi was found to be in the descending sequence of *Aspergillus flavus*, *A. niger*, *A. candidus*, *A. funigatus*, *Rhizopus nigricans* showing 110, 55, 51.5, 36, 8.5X 10^2 colonies/g of feed respectively. With longer storage, the fungal populations in the above sequence showed only marginal changes whereas in treated feed, fungi decreased, comparatively more rapidly at higher level of treatment at the end of the experiment (Table 1).

Table 1. Total fungal colonies (X 10^2/g feed) in cinnamon oil treated feed

Fungi	Treatment (%)								
	0			0.1			0.2		
	Days-10	20	30	10	20	30	10	20	30
Aspergillus flavus	110.0	112.0	120.5	60.0	25.5	0	35 0	12.5	0
A. niger	55.0	58.5	64.0	42.0	20.0	0	24.5	6.5	0
A. candidus	51.5	54.5	60.5	35.0	12.5	4.5	17.5	8.0	2 0
A. fumigatus	36.0	38.0	40.0	10.5	4.0	0	5.0	0	0
Rhizopus nigricans	8.5	8.5	9.0	2.0	0	0	1.0	0	0
Total	261.0	271.5	294.0	149.5	62.0	4 5	83.0	21.0	2.0

* Mean of five replicates

Table 2. Consumption of test diet treated with cinnamon oil after different periods

Batch	Treatment	Consumption of feed (g)*					
	Days	5	10	15	20	25	30
A	Untreated Poultry feed	42.4	56.6	69.4	85·5	99.5	115.5
B	0.1% cinnamon treated poultry feed	59.0	71.4	88.3	105.0	120.5	141.5
C	0 2% cinnamon treated poultry feed	38.5	50.0	58.5	70.5	90.4	98 5

* Mean of five chicks

Table 3. Body weight of poultry birds fed on test diet treated with cinnamon oil after different periods

Batch	Treatment	Body weight (g)*						
	Days	0	5	10	15	20	25	30
A	Untreated poultry feed	95.5	115.5	155.5	190.7	221.5	266.8	305.0
B	0.1% cinnamon treated poultry feed		130.0	170.5	230.5	292.2	332.5	382.4
C	0.2% cinnamon treated poultry feed		105 5	135.7	161 4	190.5	215.5	260.5

* Mean of five chicks

Consumption of feed and body weight

The poultry birds always consumed higher level of 0.1% cinnamon oil treated feed (batch B) than that of batch A (control). However, consumption of batch C (0.2%) remained slightly lower than control throughout the test period (Table 2).

The body weight increase was also highest in batch B in most cases, followed by batch A and batch C in decreasing sequence (Table 3). The poultry birds did not show any sign of illness or morphological abnormality during the test period.

DISCUSSION

Poultry birds evidently preferred lower level of cinnamon oil treated feed over control feed, indicating that the odour of the essential oil did not inhiblt acceptability and the nutritive value of the diet which according to Jones *et al.* (1974) it was a desirable character of a preservative. Lower consumption of feed treated with higher level of cinnamon oil might be due to the strong odour which the birds did not appreciate,

The poultry birds did not show any morphological abnormality of apparent loss in appetite. Steady increase of the body weight exhibited by batch B showed that the treatments did not adversely affect the nutritive value of the diet (cf. Bose *et al.* 1986).

The heavy mould infection at the onset of the present study reflect that such condition is likely to be quite common in poultry feed stored in gunny bags (a common practise in India) and kept under natural conditions. The microbial activities will not only decrease the nutritive value of the feed to a great extent but also often contaminate the feed with mycotoxin resulting toxicity to animals (Ghosh *et al.*, 1983). Nandi (1990) reported that the extensive fungal infestation in animal feed could effectively be controlled by various volatile fungitoxic compounds. On the other hand, treatment with cinnamon oil (essential of plant origin) appears to be quite effective in the present study.

Thus, cinnamon oil showed potentiality as feed preservative which was evidently more desirable than fungus infected feed possessing health hazards from possible mycotixin contamination. However, before any commercial application is recommended, the possible delayed effect if any, of cinnamon oil treated feed on the test animals, supplied regularly with the feed, should be recorded.

ACKNOWLEDGEMENT

Financial assistance from the Adaptive Research Council, Department of Agricultural Govt. of West Bengal, is gratefully acknowledged.

REFERENCES

Bose, A , Mondal, G. C. and Nandi, B. (1986). Preservation of poultry feed from fungal infection by Allyl-iso-Thiocyanate. *B. U. J. of science* 3 (1), 105-110.

Chaumont, J. P. and Bardey, I. (1989). *In-vitro* antifungal activity of seven essential oils. *Fitoterpia* **60** (3), 263-266.

Deshmkuh, S. K., Jain, P. C and Agarwal, S. C. (1986). A note on mycotoxicity of some essential oils. *Fitoterpia* **57** (4), 245-297.

Farag, R, S., Daw, Z. Y., Hewedi, F. U. and El-Baraty, G. S. A. (1989). Antimicrobial activity of some Egyptian spice essential oils. *J. Food Prot.* **52** (9), 665-667.

Ghosh, J., Nandi S. N.. Nandi, B and Thomke, S (1983). Acceptability and pathological changes in organs of rats fed wheat contaminated with a mixed culture of *Aspergillus* and *Penicillium* sp. *Nord. Vet. Med.* **35**, 364-371.

Jones, G. M., Mowat, D. N., Eltiat, J. I., and Moran, Jr. E. T. (1974). Organic acid preservation of high moisture corn and other grains and the nutritional value. *A review Can, J. Anim. Sci.*, **54**, 499-517.

Mallick, A. K., and Nandi, B. (1982). Preservation and palatability of citral and propionic acid treated grains. *Acta. Agric. Scand*, **32**, 177–187.

Mishra, N. and Batra. S. (1987). Efficiency of essential oil *Cinnamon umtamal* Ness and Ederm against *A. flavus* NR L 3251 and *A. parasiticus* NRRL 2999 producing mycotoxins in stored seeds of groundnuts. *Indian Perfumer* **31**(4), 332-334.

Mukherjee, P, S., Nandi, S. K. and Nandi. B. (1992). Antifungal activity of some essential oils against storage fungi. *J. Mycopathol. Res.* **30** (2), 121-125.

Nandi, B. (1990). Preservation of seeds by antifungal volatile compounds. 5th International Working Conference on Stored Products Protection, France.

Nigam, S. S. and Rao, T. S. S. (1977). Proc. VIII. International Congress of Essential Oils. 485-487, Tokyo, Japan.

Onawunmi, Grace, O. (1989). Evaluation of the antitungal activity of lemon grass oil. *Int. J. Crude Drug. Res.* **27**(2), 121-126.

Paster, N. (1979). The efficacy of luprosil NC as a feed preservative. *World's Poultry Sci. J.* **35**, 244-248.

(Accepted for publication 25 October 1993)