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Influence of Humidity on Biodeterioration and Patulin and Terreic Acid Production by *Aspergillus terreus* in Pearl Millet

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Influence of relative humidity (RH) on the seed deterioration of pearl millet and patulin and terreic acid production by *Aspergillus terreus* in pearl millet (*Pennisitum americanum*) seeds was investigated. Relative humidity above 80% has accelerated the pearl millet seed deterioration. The amount of patulin and terreic acid production was maximum at RH 100%. Secretion of patulin and terreic acid was markedly enhanced when the relative humidity of storage was above 50%

Key Words: – Deterioration Humidity Patulin Seed Terreic Acid.

Fungal infestation of seed brings a significant change in chemical constituents of seeds which leads to their deterioration (Charya & Reddy, 1981; Cherry 1983). The rate of seed deterioration is influenced by various physical and biological factors. The moisture content of seed, temperature and relative humidity of storage place are of primary importance. Christensen & Kaufmann (1969) reported that the humidity influences sporulation and increases the available inoculum of the fungus, while high moisture content of the seeds accelerates their deterioration. Such infested seeds besides losing the germinability may also cause mycotoxicosis in mammals if they are consumed (Frazier & Westhoff, 1978). A number of fungi produce toxic substances on stored seeds and grains (Tripathi, 1973; Sreenivasamurthy, 1975; Bilgrami *et al.*, 1980). Though the influence of humidity on deterioration of food grains by storage fungi has been studied (Christensen & Kaufman, 1969; Rengifo & Pfast, 1978), no information is available on pearl millet seeds. Hence, the influence of humidity on the rate of deterioration of pearl millet seed and on the production of patulin and terreic acid by *A. terreus* was studied.

MATERIALS & METHODS Pearl millet seeds (200 g) were surface sterilized with 0.1% $HgCl_2$ and inoculated with 5 ml of spore suspension from 7 day old culture of A. *terreus*. The seeds were stored in 250 ml flasks at room temperature (27±2 C) for 30 days in humid chambers maintained at different relative humidity. At least three replicates were maintained. On the 30th day seeds were analysed for reducing sugars, phenols, proteins (Mahadevan & Sridhar. 1986) and free fatty acids (OAC, 1960). Patulin and terreic acid were extracted and estimated according Subramanian (1982) and Subramanian *et al.* (1978), respectively.

RESULTS & DISCUSSION The relative humidity levels profoundly influenced the deterioration of pearl millets seeds by *A. terreus* (Table 1). Reducing sugars increased in the both the control and infected seeds with an increase in the RH of storage chamber. Increase in reducing sugars was high in *A. terreus* treated seeds kept at 100% RH. The increase in reducing sugars may be attributed to the hydrolysis of host complex carbohydrates by infesting fungus. Vidyasekharan & Govindaswamy (1968) also reported depletion of starch and increase of reducing sugars in rice grains inoculated with different seed-borne fungi. The increase in reducing sugars with increase in RH of storage chamber seeds may be attributed to the hydrolysis of seed starch by the amylase of seeds due to the availability of moisture.

The phenols though did not show definite trend, increased in the *A. terreus* treated seeds. The increase of phenols in *A. terreus* treated seeds is a general response (Gurdip Singh & Bedi 1976).

A. terreus treatment increased the proteins of seeds and was high at 100% relative humidity. The increase in protein may be due to the accumulation of fungal protein or due to host-pathogen interaction (Cherry *et al.*, 1974; Sinha *et al.*, 1982).

The free fatty acids (FFA) increased with the increase in RH. It was more in seeds treated with *A. terreus*. Increase in FFA was also recorded in the seeds of cotton (Mc Gee & Christensen, 1970), castor (Lalithakumari *et al.*, 1971a),

Table 1 Influence of Humidity on Deterioration, Patulin and Terreic acid Production by *A.terreus* in Pearl Millet Seeds Stored for 30 day.

Relative humidity (RH)	Reducing sugars *(in mg/g)*		Phenols *(in mg/g)*		Proteins *(in mg//g)*		Free fatty acids *(in mg KOH/ 100 g)*		Patulin (in ppb)	Terreic acid(in ppb)
	C	T	C	T	C	T	C	T		
30	68	48	0.11	0.16	4.0	5.9	0.20	0.31	20	60
50	72	58	0.08	0.12	4.1	6.5	0.31	0.34	22	70
70	76	68	0.06	0.10	4.2	6.7	0.37	0.40	40	75
80	80	67	0.06	0.10	4.4	6.9	0.54	1.64	38	80
90	86	68	0.07	0.11	4.5	7.4	1.26	1.77	48	90
100	80	93	0.12	0.18	4.6	8.6	1.43	2.00	60	98

C = Control ; T = Treated with *A. terreus*.

groundnut (Lalithakumari *et al.* 1971b) and sunflower (Singh & Prasad, 1977) treated with fungi. The increase in FFA may be attributed to the lipase activity of either seed or infested fungus (Christensen, 1974). White *et al.*(1976) also observed a close relation between moisture content and free fatty acid development in seeds studied by them.

The quantity of patulin produced varied significantly and was influenced by humidity. It was maximum in seeds stored at 90% RH and 100% and minimum in seeds stored at 50% RH and below. Similarly terreic acid production by *A. terreus* gradually increased with an increase in RH (30-100). The increase was maximum at RH 80% and above. In general positive correlation was observed between patulin and terreic acid production.

The infestation of pearl millet seed by *A. terreus* not only accelerated the seed deterioration by inducing significant biochemical changes but also increased the production of patulin and terreic acid which are toxic to plants and mammals (Frazier & Westhoff, 1978; Subramanian, *et al.*, 1978). The biodeterioration was further accelerated by increase in relative humidity of storage chamber.

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