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Changes in protein and total amino acids contents in the seeds of *Schleichera oleosa* (kusum) due to biodeterioration by pathogenic fungi during storage

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One of the non-edible oil-yielding tree, Kusum (*Schleichera oleosa*, Fam Sapindaceae has been of great use in the lives of the Jharkhandis. Each and every part of kusum plays a role in eco-economy of the people of Jharkhand. The oil cake of kusum is an excellent manure and finds usage in agriculture. However, due to a lack of proper backup infrastructure the quantity of the oil cake deteriorates as the seeds, during storage, undergo disintegration due to growth of several mycodwellers as reported earlier. Along with other nutrients proteins and amino acids contents of seed also show considerable reduction during storage. The protein content dropped steadily over the year from 8.5 to 6.57 per cent while that of amino acids dropped from 1.4 to 1.21 per cent after an initial increase for four months.

Key words : Kusum, *Schleichera oleosa*, mycodwellers, manure, biodeterioration

INTRODUCTION

Kusum (*Schleichera oleosa* syn. *S. trijuga*, family Sapindaceae) is a lush green tree with spreading roots and of good distribution in the state of Jharkhand. This tree has carved a niche in the eco-economy of the people of the state virtue of its beneficial aspect. Each and every part are useful, for example, timber, soil binding root, canopy even during an otherwise leaf abscission time of February-March, fruit, oil seed, oil cake as manure and non edible oil used in varnishing, paints polishing, massage etc. The plant is host to an excellent quality lac called Mirzapur lac. The wood in slow combusting, gives best quality charcoal and following combustion gives a very fine powder of ash.

The oil seeds of kusum collected by villagers and farmers, are deposited with Minor Produce Department of Forest Department, Ranchi. The seeds are stored in kuchha warehouses where the condition is damp, humid and devoid of light and helps the growth of mycodwellers leading to biodeterioration during storage (Srivastava and Pandey, 2000).

The effect of the biodeterioration is qualitative and quantitative. The seeds lose viability fast and its nutrients register a fall. One of the important category of nutrients, proteins and amino acids show a reduction due to fugal attack.

MATERIELS AND METHODS

Protein estimation of Kusum seeds was done following the method of Lowry *et al.* (1951). The protein sample was suspended in 1 ml of IN NaOH at 100°C. Five ml of alkaline Cu-reagent was added to the sample. It was mixed with 1-drop folin-ciocaltau reagent. The absorbence was measured at 720 nm in a Colorimeter (Systronics India) and compared against a standard using serum albumin.

Amino acids, that are building blocks of proteins, are also found in free nature in the seeds. Its content was estimated using ninhydrin a powerful oxidant reaction with which gives a blue colour. The presence of amino acids was colorimetrically measured at 570 nm.

Kumsum seeds are harvested and stored in June and from June onwards as control, readings were taken at 1 month intervals till May next year in three replications.

RESULTS AND DISCUSSION

The amount of protein diminished significantly only after one months storage, probably due to fungal infestation taking June 1994 as control (Table 1). From 8.5 per cent protein content in the seeds in June 1994 in course of one year of storage in May 1995 the protein level dropped to 6.57. The trend of continued loss in protein content may be due to the association of fungi in and around the seeds.

The amino acid contents of Kusum seeds were analysed for one year at one month intervals. During the first few months the amino acid pool swelled, showing a regular decline thereafter (Table 2). By September the rise was by 83 per cent but thereafter there was a regular decline in amino acid content and by May 1995 the reduction was by 19 per cent. The initial gain in amino acid pool may be due to a fast breakdown of protein in the humid months of up to October 1994 and less utilization of amino acids by the mycodwellers. Thereafter the amino acids might have been utilised at a faster rate by the associated fungi along with proteins showing a neck to neck decline.

The loss in host protein content has been reported for several host-pathogen interactions. Sharma and Wahab (1975) reported protein losses in wheat infested with *Puccinia graminis* and *Luffa cylindica* with *Pythium aphanidermatum*. The products of proteins, amino acids are directly utilised by the fungi as a ready source of nutrient. Decline in protein content in seeds due to colonization by fungi in *Vigna mungo* (Jamaluddin *et al.*, 1971), by *Aspergillus niger* and *Alternaria alternata* in sesamum (Singh and Prasad, 1981), by strains of *Aspergillus flavus* in cowpea (Vijaykumari and Karan, 1981), by fungal association in rice (Bilgrami *et al.*, 1979) has earlier been reported. However, unchanged nitrogen levels were reported by Sinha *et al.* (1977) and Cherry *et al.* (1975) for moong and peanut seeds respectively.

With regards to amino acids, there are several reports showing changes in various host pathogen reactions Prasad *et al.* (1970), Bilgrami *et al.* (1976) and Sinha and Prasad (1977) reported changes in amino acid contents of seeds of moong and other pulses infected with *Aspergillus flavus*. Bilgrami *et al.* (1981) found remarkable changes in the quality and concentration of amino acids in maize seeds infested with *Aspergillus parasiticus*. There were at times increases in the amount of certain amino acids in the infested maize seeds. It might have been due to enzymatic breakdown of seeds protein. Late phase infestation, however, lowered the amount of amino acids probably by the consumption by the invading fungi. Reisner and Zeigler (1970) on the other hand reported that fall in amino acids level in diseased seeds could be due to the use up of these building blocks for synthesis of fresh proteins by the pathogen.

It is thus appears that seed infestation of *Schleichera oleosa* during storage predominantly and jointly by *Aspergillus fumigatus A. flavus, A. niger, Paecilomyces variotii, Fusarium solani* and *Mucor* sp. causes biodeterioration of its seeds (Srivastava and Pandey, 2000) and results in diminution of protein and amino acids content.

Table 1. Change in the amount of protein in kusum seed powder (1 g) during storage

	Protein content		
Storage time (months)	Wt (mg)	Percentage	% Change
Jun 94	85.0	8.50	-
Jul 94	84.1	8.41	-.09
Aug 94	82.2	8.22	-.28
Sep 94	81.0	8.10	-.4
Oct 94	79.1	7.91	-.59
Nov 94	77.1	7.71	-.79
Dec 94	75.6	7.56	-.94
Jan 95	75.0	7.50	-1.0
Feb 95	73.7	7.37	-1.13
Mar 95	71.2	7.12	-1.38
Apr 95	68.1	6.81	-1.69
May 95	65.7	6.57	-1.93
SD	0.61		
SE	0.18		

Table 2. Change in the amount of total amino acid content in kusum seed powder (1 g) during storage

	Total amino acid		
Storage time (months)	Wt (mg)	Percentage	% Change
Jun 94	14.0	1.4	-
Jul 94	17.1	1.71	+.31
Aug 94	20.6	2.06	+.66
Sep 94	22.3	2.23	+.83
Oct 94	20.1	2.01	+.61
Nov 94	17.3	1.73	+.33
Dec 94	16.1	1.61	+.21
Jan 95	14.9	1.49	+.09
Feb 95	14.1	1.41	+.01
Mar 95	13.2	1.32	-.08
Apr 95	12.8	1.28	-.12
May 95	12.1	1.21	-.19
SD		0.33	
SE		0.09	

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