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Starch and Glucose Content and Changes therein in the Seeds of *Schleichera oleosa*(kusum) due to Bioterioration by Pathogenic Fungi during Storage.

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Research Article

Abstract:: Seeds of one of the non-edible oilseed, kusum(*Schleichera oleosa f . Sapindaceae*) are of great significance in Jharkhand area and its oil is used in burning lamps, varnishing, massage and medicine. Its oil-cake is a good manure. The unsanitary and humid condition makes it prone to a faster biodeterioration due to several fungal inhabitants during storage. The colonising fungi in the seeds use up some of the glucose and starch as carbon sources for meeting energy requirements in their prolonged association with the seeds. In the span of one year the glucose level dropped by as much as 50.2 percent of its initial value. The starch in the stored seeds reduced steadily from 2.55 percent of dry seed weight to 1.25 percent due to the association of the mycodwellers.

Keywords : *Schleichera oleosa,* oilseed, colonising fungi, carbon sources, mycodwellers.

Introduction:

Seed pathology is up and coming area of plant pathology and has attained a great magnitude. Seeds of a non edible oil, *Schleichera oleosa* f. Sapindaceae (Kusum) are of great use in burning lamps, varnishing, massage and medicine. Its oil-cake is good manure. In the Jharkhand area, Kusum seeds are collected just after onset of rainy season i.e. by the end of month of May. Conventionally seeds are stored in gunny bags in the village houses and godowns. In either case the condition is unsanitary and humid and is conducive for fungal growth leading to good scale destruction.

There are many reports indicating that fungi are associated with seed surface as well as internal mycoflora(DUTTA & ROY , 1987 ; JAYWEERA *et al* 1988). It was worthwhile to seek the extent of biodeterioration occurring in the seeds in terms of carbohydrates in different forms viz. glucose and starches.

Material and Methods:

Kusum seeds were obtained from the godown of Ranchi forest department for the preparation of oil and oilcake on regular interval of one month. The work spanned from June 2001, one harvest season to May 2002, just before the other harvest season. Glucose content was estimated by titration method using Fehling solutions (Cole's method, 1933). Starches were estimated by colorimetric method using anthrone as a reagent (DUBOIS et. al., 1951) using a colorimeter of Systronics (India) make. Estimations were done in triplicate and standard deviation and standard errors were calculated.

Results and Discussion:

The effect of continued fungal activity on the seeds manifested in the lowered glucose and starch contents just like oils (SRIVASTAVA, AK and PANDEY GK, 2000). The glucose level dropped by as much as 50.2 percent in the span of one year of its initial value. The starch in the stored seeds reduced steadily from 2.55 percent of dry seed weight to 1.25 percent due to the association of the mycodwellers. The results are elaborated in tables and figs 1-2.

Table 1: Amount of glucose present in 1 g of Kusum seed powder samples through one year of biodeterioration due to fungal attack , June '01- May '02.

S No	Month	Wt.(mg)	Percentage	Change(mg)
1	Jun '01	16.75	1.675	----------
2	Jul '01	16.25	1.625	-0.05
3	Aug '01	16.25	1.625	-0.05
4	Sept '01	15.75	1.575	-0.1
5	Oct '01	14.9	1.49	-0.175
6	Nov '01	14.3	1.43	-0.245
7	Dec '01	13.1	1.31	-0.365
8	Jan '02	13.0	1.3	-0.375
9	Feb '02	11.9	1.19	-0.485
10	Mar '02	10.3	1.03	-0.645
11	Apr '02	9.5	0.95	-0.725
12	May '02	8.35	0.835	-0.84
	S.D. 0.284	S.E 0.081		

Final percent change in glucose content [(1.675 – 0.835)/1.675] 100= 50.2%

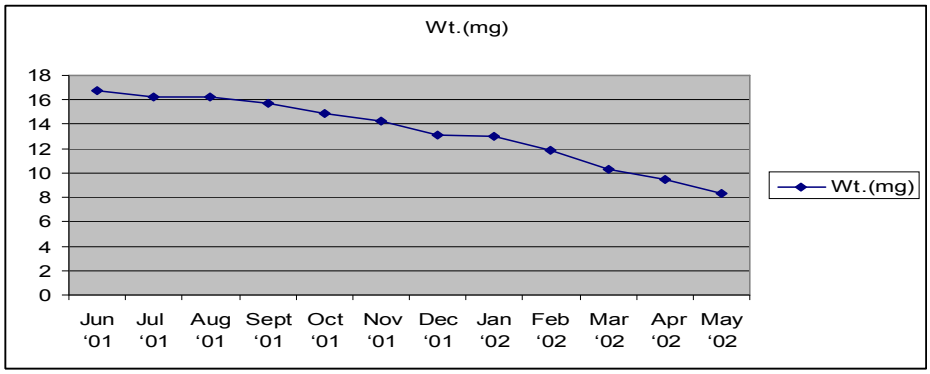

Fig 1: Amount of glucose present in 1 g of Kusum seed powder samples through one year of biodeterioration due to fungal attack, June '01- May '02.

Table 2: Amount of starch present in 1 g of Kusum seed powder samples through one year of biodeterioration due to fungal attack, June '2001 - May '02

S No	Month	Wt.(mg)	Percentage	Change(mg)
1	Jun '01	25.5	2.55	----------
2	Jul '01	24.0	2.4	-0.15
3	Aug '01	22.3	2.23	-0.22
4	Sept '01	22.0	2.2	-0.25
5	Oct '01	21.6	2.16	-0.39
6	Nov '01	19.9	1.99	-0.56
7	Dec '01	17.9	1.79	-0.76
8	Jan '02	17.1	1.71	-0.84
9	Feb '02	16.3	1.63	-0.92
10	Mar '02	14.8	1.48	-1.07
11	Apr '02	12.9	1.29	-1.26
12	May '02	12.5	1.25	-1.30
	SD:0.430	S.E.: 0.124		

Final percent change in starches content [(25.5-12.5)/25.5]100 = 50.98%

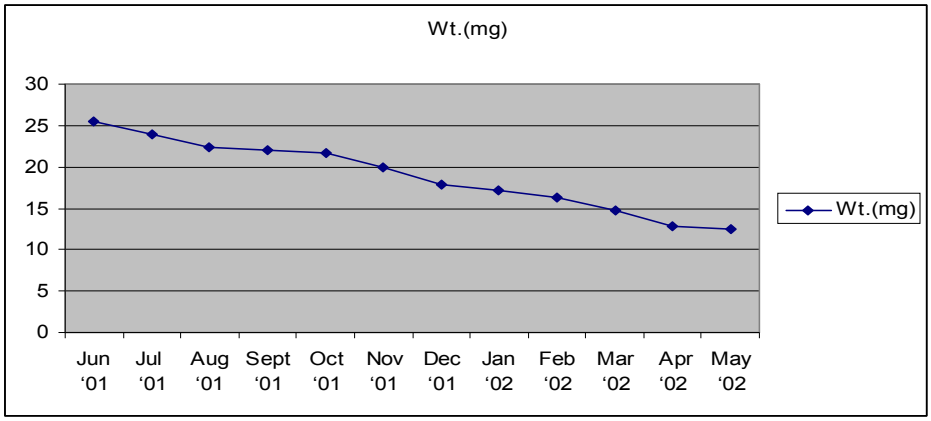

Fig 2: Amount of starch present in 1 g of Kusum seed powder samples through one year of biodeterioration due to fungal attack , June '2001 - May '02

Changes in glucose content with pathogenic association have been reported. CHAUDHARY and PRASAD (1974) found a depletion of glucose among other nutrients in the shoot tissues of pigeon pea infected with *Fusarium oxysporum* f.sp.*udum* . CHATTOPADHYAYA and NANDY (1978) a carbohydrate loss to *F. subglutinum* infection. Loss in amount of glucose in fruits have been reported for tomato- *Drechslera australiense* (KAPOOR and TANDON, 1970); tomato- *Alternaria solani* (MEHTA et. al., 1975); banana- *Gloeosporium musarum*(WANG , 1960) and citrus- *Xanthomonas campestris* pv.*citri* (VIDYASEKARAN and DURAIRAJ, 1971) host pathogen systems.

Similarly the depletion in the starch content is commensurate with the activation of starch degrading enzymes especially **beta – *amylase*** (SCHIPPER and MIROCHA, 1977) . The drop is due to the sugar being used by the fungal pathogens as respiratory substrates(BAKER, 1965; WU , 1973) . In pigeon pea seeds infested with *Aspergillus flavus*, SINHA and PRASAD (1977) found a depletion of starches. Likewise BILGRAMI et.al., (1979 b) recorded a considerable decrease in the amount of starch in paddy seeds during 60 and 90 days of fungal infestation of an aflatoxin producing strain of *Aspergillus parasiticus*. SINHA et.al., (1981) found a considerable reduction in the starch content of Cajanus cajan seeds infested with *Aspergillus flavus* and *A. Niger*. However , these seeds , when infested with *Alternaria alternata* and *Curvularia lunata*, showed a moderate reduction in the starch contents . On the contrary, *Cajanus* seeds infested with *Fusarium moniliforme* and *Drechslera hawaiiensis* exhibited a minimum level reduction in starch contents. Later on, SINGH and SINHA (1985) confirmed that infestation of *Cajanus* seeds by *Aspergillus parasiticus* caused a considerable decline in their starch contents. PRASAD (1989) reported a loss of starch in fungi infested seeds of *Coriandrum indicum* and the maximum loss in starch was due to *Aspergillus flavus* followed by *Curvularia lunata.* All these reports are concurrent to our findings. It is thus apperant that one year of seed infestation of *Schleichera oleosa* predominantly and jointly by *Aspergillus fumigatus, A. flavus, A. niger, Fusarium solanii, Paecilomyces variotii* and *Mucor sp*. causes biodeterioration of its seeds manifested in the diminishing of carbohydrate contents.

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