J. Mycopathol, Res, ***49(2)*** : *337–339 (2011)*

Total carbohydrate content and changes therein in seeds of *Schleichera oleosa* (kusum) due to biodeterioration by pathogenic fungi during storage

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Received : 25.02.2010 Accepted : 24.06.2011 Published : 24.10.2011

Seeds of one of the non-edible oilseed, kusum (*Schleichera oleosa,* Sapindaceae) are of great significant 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 proned to a faster biodeterioration due to several fungal inhabitants during storage. The colonising fungi in the seeds used up some of the glucose, sugars 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 per cent of its initial value. Similarly, totall sugar also registered a loss of 40.4 per cent. The starch in the stored seeds reduced steadily from 2.55 per cent of dry seed weight to 1.25 per cent due to the association of the mycodwellers.

Key words: *Schleichera oleosa,* oilseed, colonising fungi, carbon sources, mycodwellers

INTRODUCTION

Seed pathology is an up coming area of plant pathology and has attained a great magnitude. Seeds of a non edible oil, *Schleichera oleosa.* 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. It is worthwhile to seek the extent of biodeterioration occurring in the seeds in terms of carbohydrates in different forms viz. glucose, total sugars and starch.

MATERIALS 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. Total sugars and starch 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, total soluble sugars and starch contents just like oils (Srivastava and Pandey 2000). The glucose level dropped by as much as 50.2 per cent in the span of one year of its initial value. Similarly, total sugar also registered a loss of 40.4 per cent. The starch in the stored seeds reduced steadily from 2.55 per cent of dry sed weight to 1.25 per cent due to the association of the mycodwellers.

Changes in glucose content with pathogenic association have been reported. Loss in amount of glucose in fruits have been reported for tomato - *Drechslera australiense* (Kapoor and Tandon 1970); tomato - *Alternaria solani* (Mehta *et. al.,*

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.

Month	Wt.(mg)	Percentage	Change (mg)
Jun '01	16.75	1.67	
Jul '01	16.25	1.62	-0.05
Aug '01	16.25	1.62	-0.05
Sept '01	15.75	1.57	-0.1
Oct '01	14.9	1.49	-0.17
Nov '01	14.3	1.43	-0.24
Dec '01	13.1	1.31	-0.36
Jan '02	13.0	1.3	-0.37
Feb '02	11.9	1.19	-0.48
Mar '02	10.3	1.03	-0.64
Apr '02	9.5	0.95	-0.72
May '02	8.35	0.83	-0.84
S.D. 0.284	S.E. 0.081		

Final per cent change in glucose content : [(1.675-0.835)/1.675] 100 = 50.2%

Table 2 : Amount of sugars present in 1 g of kusum seed powder samples through one year of biodeterioration due to fungal attack, June '01 - May '02

Month	Wt.(mg)	Percentage	Change (mg)
Jun '01	47	4.7	
Jul '01	47	4.7	- 0
Aug '01	45	4.5	- 0.2
Sept '01	44	4.4	- 0.3
Oct '01	41	4.1	- 0.6
Nov '01	40	4.0	- 0.7
Dec '01	37	3.7	- 1.0
Jan '02	35	3.5	- 1.2
Feb '02	34	3.4	- 1.3
Mar '02	32	3.2	- 1.5
Apr '02	30	3.0	- 1.7
May '02	28	2.8	- 1.9
S.D. 0.663	S.E. 0.191		

Final per cent change in sugar content : [(47-28)/47] 100 = 40.425%

1975); and banana-*Gloeosporium musarum*, (Wang 1960).

Changes in total sugar content in the host tissue due to pathogenic actions have been reported by Craig and Hooker (1961); Dhanvantari (1967),Dayal and Joshi; (1968) and Padmanabhan, *et al.* (1988) on different host pathogen systems.

Similarly the depletion in the starch content is commensurate with the activation of starch degrading enzymes (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) have found a depletion of starch. Likewise Bilgrami *et al.* (1979) have recorded a considerable decrease in the amount of strach in paddy seeds during 60 and 90 days of fungal infestation by an aflatoxin producing strain of *Aspergillus parasiticus.* Sinha *et al.*, (1981) have 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,* have shown a moderate reduction in the starch content. On the contrary, *Cajanus*-seeds infested with *Fusarium moniliforme* and *Drechslera hawaiiensis* have exhibited a minimum level reduction in starch contents. Later on, Singh and Sinha (1985) have confirmed that infestation of *Cajanus* seeds by *Aspergillus parasiticus* caused a considerable decline in their starch contents. Prasad (1989) has reported a loss of starch in fungi infested seeds of *Coriandrum indicum* and the maximum loss in starch has been 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 *Scheleichera oleosa* predominantly and jointly by *Aspergillus fumigatus, A. flavus, A. niger, Fusarium solanii, Paecilomyces variotii* and *Mucor*

Table 3 : 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

Month	Wt.(mg)	Percentage	Change (mg)
Jun '01	25.5	2.55	----------
Jul '01	24.0	2.4	- 0.15
Aug '01	22.3	2.23	- 0.22
Sept '01	22.0	2.2	- 0.25
Oct '01	21.6	2.16	- 0.39
Nov '01	19.9	1.99	- 0.56
Dec '01	17.9	1.79	- 0.76
Jan '02	17.1	1.71	- 0.84
Feb '02	16.3	1.63	- 0.92
Mar '02	14.8	1.48	- 1.07
Apr '02	12.9	1.29	- 1.26
May '02	12.5	1.25	- 1.30
S.D. 0.430	S.E. 0.124		

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

sp. causes biodeterioration of seeds manifested in the diminishing of carbohydrate contents.

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