INFESTATION ASPECTS OF PACKAGED GRAINS

Studies on Biological (infestation) deterioration in PWS

1. The aim of this study was to know the dynamics of fungal population in short term storage (six months) of food grains using different packaging materials.

2. To test the ability of insect penetration through different packaging materials.

Commodities such as rice, paddy and wheat were procured from local market and stored for six months at room temperature using three different packaging materials viz., Jute, Polypropylene (PP) and high-density polyethylene (HDPE) bags. Surface and representative samples were drawn periodically every month (from March 2004 to August 2004) to estimate the fungal populations in all three commodities mentioned above.

Fungal population was estimated using standard serial dilution method. Ten gm of thoroughly mixed grain was taken into 250 ml conical flask containing 90 ml sterile distilled water. From this, further dilutions were prepared up to 10^5. Appropriate dilutions (10^3, 10^4 and 10^5) were pour plated on 9mm petri plates using Potato Dextrose agar (PDA) medium. The plates were incubated at 25^0C $\pm$ 1 for 5-7 days. After 7 days the colonies were counted and fungal species were identified according to Raper and Tham.

RESULTS

The results are summarized in table 13-18.

Table-13 Fungal population in rice stored for 6 months at room temperature

The result of the study has shown that during six months storage, no significant increase of fungal population was observed in all the three packaging materials.

Table-14 Fungal population in paddy stored for 6 months at room temperature

The result of the study has shown that the fungal population increased up to three months, followed by fluctuation in the population from 4^{th} to 6^{th} month.

Table-15 Accelerated study on rice and paddy storage (RH 92% and 38^0C)

In this study the fungal spoilage was very fast and within 15 days, visible fungal growth was observed in both the commodities.

Table-16 Fungal population in wheat stored for 6 months at room temperature

This study has shown significant decrease in fungal population from 1^{st} month to 6^{th} month.

Table-17 Accelerated study on wheat storage (RH 92% and 38^0C)

This study indicated that the fungal population increased within few days and led to total deterioration of the grain in 15 days.

Table-18 Insect penetration through different packaging materials

The results of this investigation show that PP and HDPE are more superior in preventing insect penetration than Jute bags, in which upto 98% penetration was observed compared to 0-2.9% in HDPE and PP, respectively.

The following are the fungal species isolated and identified

Species of *Aspergillus* like *Acandidus, Aspeluneus,* A *niger, Afumigatus, Aochraceous, Aflavipes, Aversicolar, Aornatus, Asparces, Asulphuricus, Aasperescens* and Spp of *Mucor, rhizopus, Alternaria* and *Penicillium.*

Table 13. Fungal population in rice stored for six months at room temperature

Duration of storage	Fungal population (x 10^3/cfu/g)					
	Jute		PP		HDPE	
	Surface	Rep	Surface	Rep	Surface	Rep
Initial	NT	17.1± 3.0	NT	17.1± 3.0	NT	17.1± 3.0
1st month	1.4 ± 0.2	1.0 ± 0.1	Nil	Nil	Nil	Nil
2nd month	1.0 ± 0.2	Nil	1.0 ± 0.2	Nil	2.2 ± 0.4	Nil
3rd month	Nil	Nil	3.2 ± 0.6	1.0 ± 0.2	3.6 ± 0.9	1.0 ± 0.2
4th month	Nil	Nil	Nil	Nil	Nil	Nil
5th month	Nil	Nil	Nil	Nil	Nil	Nil
6th month	Nil	Nil	Nil	Nil	Nil	Nil

Values represent the mean ± standard deviation of triplicate plates

Table 14. Fungal population in paddy stored for six months at room temperature

Duration of storage	Fungal population (x 10^3/cfu/g)					
	Jute		PP		HDPE	
	Surface	Rep	Surface	Rep	Surface	Rep
Initial	NT	33.0± 3.8	NT	33.0± 3.8	NT	33.0± 3.8
1st month	60.4 ± 5.1	28.5 ± 0.4	46.7±4.4	38.0±4.2	39.3±3.8	62.0±2.4
2nd month	68.2 ± 7.2	58.1 ± 5.2	58.0 ± 5.2	65.0 ± 6.1	55.3 ± 4.0	28.0 ± 9.2
3rd month	98.4 ± 13.7	65.0 ± 7.6	101.4 ± 13.8	86.0 ± 12.1	90.1 ± 12.4	60.8 ± 11.8
4th month	60.0 ± 6.6	58.6 ± 7.7	45.0 ± 9.3	78.7 ± 9.6	35.0 ± 9.6	26.9 ± 9.2
5th month	36.3 ± 4.6	20.7 ± 6.4	20.2 ± 1.8	22.6 ± 1.1	19.0 ± 7.0	11.0 ± 4.5
6th month	32.6 ± 3.1	88.4 ± 6.8	55.1 ± 3.2	56.0 ± 4.8	71.8 ± 8.3	55.9 ± 5.3

Values represent the mean ± standard deviation of triplicate plates

Table 15. Accelerated study on rice and paddy storage (rh 92% and 38^0c)

Commodity	Duration of Storage	Fungal population ($x10^3$/cfu/gm)		
RICE	Initial	Jute	PP	HDPE
		Nil	Nil	Nil
	8 days	3.2±0.4	3.8±0.5	4.2±0.3
	15 days	214.7±9.9	13.7±0.2	4.1±0.8
	30 days	> 300	> 300	> 300
PADDY	Initial	24.2±5.1	24.2±5.1	24.2±5.1
	8 days	77.2±6.2	74.8±5.9	79.4±5.6
	15 days	96.3±8.1	140.5±12.4	131.0±12.4
	30 days	> 300	> 300	> 300

Values represent the mean ± standard deviation of triplicate plates

Table 16. Fungal population in wheat stored for six months at room temperature

Duration of Storage	Fungal population ($x10^3$/cfu/gm)		
	Jute	PP	HDPE
Initial	124.0±11.2	124.0±11.2	124.0±11.2
1st month	77.0±2.9	41.0±3.4	28.9±2.8
2nd month	10.0±1.4	3.0±0.2	2.0±0.2
3rd month	Nil	Nil	Nil
4th month	1.0±0.2	Nil	1.0±0.2
5th month	Nil	Nil	Nil
6th month	Nil	Nil	Nil

Values represent the mean ± standard deviation of triplicate plates

Table 17. Accelerated study on wheat storage (rh 92% and 38^0c)

Duration of Storage	Fungal population ($x10^3$/cfu/gm)		
	Jute	PP	HDPE
Initial	82.7±4.25	82.7±4.25	82.7±4.25
15 days	266.3±18.3	179.8±7.4	124.2±5.8

Values represent the mean ± standard deviation of triplicate plates

Table 18. Insect penetration through different packaging materials

Packaging materials	Insects used and the percentage of penetration		
	T. castaeneum	R. dominica	S. oryzae
JUTE	98.75±6.3	83.8±7.5	67.0±4.1
PP	0.0	2.9±0.1	0.0
HDPE	0.0	0.0	0.0

Values represent the mean ± standard deviation of triplicate plates