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EFFECT OFTHRESHING, DRYING AND STORAGE METHODS ON SEED QUALITY OF MOTHBEAN

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Abstract:
Effects of Threshing, drying and storage methods on seed quality of Mothbean were studied. The seeds threshed by hand had maintained significantly very low mechanical damage to seeds and higher germination, seedling vigour and field emergence percentage. Drying of Mothbean seeds at lower temperature (shade) recorded significantly higher germination, seedling vigour and field emergence percentage. The mung seeds stored in polyethylene bags recorded significantly higher germination, seedling vigour and field emergence and lesser seed invasion by fungal flora during storage as compared to jute and cloth bags under ambient condition. It was also noted that *Altrnaria* sp., *Aspergillus* sp., *Fusarium* sp., *Rhizopus* sp., *Tricothecium* sp. And *Penicillium* sp. Were the most commonly occurring fungi irrespective of storage periods and storage containers during storage under ambient condition.
Keywords: Mothbean, seed quality, threshing, drying, container, storage.

Introduction:

Moth bean is a rich source of protein but it is yet to gain impetus in our country. One of the major problems encountered in urdbean production in India is the lack of good quality seeds. Seed yield and its quality depend on a number of factors. The time of harvesting, methods of threshing, drying and storage of seeds are among the major consideration in deciding the seed quality and productivity. Seed quality may be impaired while the seeds are still on mother plant (Pullock, 1972) Physiomorphological and physiological changes might set in, if the seeds are retained on the mother plant for a longer duration beyond physiological maturity (Ovchrov and Kizilova, 1966). Dharmalingam and Basu (1988) reported that the seed harvested at physiological maturity had highest germination and vigour than those harvested at premature. Sangakkara and Wanisekera (1990) reported that the mungbean seed quality not affected by hand threshing, drying at low temperature and storing the seeds in polyethylene bags in low temperature and relative humidity. As very little information is available on this aspect, hence an experiment was planned to study the effect of post harvest operations on seed quality of Mothbean.

Material and Methods:

Plants of Mothbean (Variety MBS-27) were harvested at physiological maturity (i.e. when green pod turns in blackish green in colour) by cutting to a height of 5 cm from ground level. Pods were removed from the harvested plants and dried on the threshing floor as per usual method of drying. The harvested pods were divided in to 5 lots. First lot was threshed by hand, 2nd by stick beating 3rd by machine threshed 300 rpm. 4th by 400 rpm and 5th by 500 rpm separately. Half threshed seeds of each threshing methods dried in the sun and remaining half threshed seed was dried in the sun and remaining half threshed seed was dried in shade. Three days were required for sun drying and 10 days were required for shade drying to reach safe moisture content level(10 $\pm$ 1 %). The threshed and dried seeds by different methods were kept in jute, cloth and polyethylene bags of 178 um of size 20cm x 30cm respectively of 1 Kg each and stored in wire – mesh almirah in masonry building having cemented wall, roof and floor under ambient condition for 9 months. The observations on moisture content and germination tests was conducted as prescribed in International rules for seed testing (ISTA, 1985). Two hundred seeds were used to isolate fungi following standard blotter and agar plate methods (ISTA,1976). The seedling vigour index was worked out following the method of Aldul Baki & Anderson (1973). For filed emergence test, sowing of mung seeds was done in randomized block design, with four replications with inter and intra-row spacing of 1 feet and 6 inches respectively. Observations for field emergence were recorded daily and finally the established seedlings were counted after one month of sowing. The experimental data was statistically scrutinized by random bloc design as per Panse and Sukhatme (1967).

Result and Discussion:

Data presented in the Table 1 showed that machine threshed at 500 rpm results into seeds

with significantly maximum mechanical damage (3.2%) which is followed by 400 rpm (2.6%) 300 rpm(1.6%), stick beating (1.4%), and hand threshed (0.3%). Saini et al. (1982), Sangakkara and Wanisekera (1990) reported that the seed threshed by hand lower mechanical damage to seed coat than machine threshed.

In was observed form the Table 1 that the germination percentage of Mothbean seeds threshed by different methods varies significantly and it was highest in hand – threshed seeds (95%) which was closely followed by stick-beating (91%), machine threshed 300 rpm (84%), 400 rpm (80%) and 500 rpm (71%). The germination percentage was decreased with increasing in mechanical damage to the seed coat of mung. It was also observed that the abnormal seedling increases with the increasing the mechanical damage to the seed coat of mung. The similar results also reported by Soesarsano and Copeland (1974), Sangakkara, Waniseker (1990), and Lambat et al. (2011) Seedling vigour index and filed emergence followed the same trends of germination. It was highest in hand- threshed seeds as compared to other threshing method.

The effect of seed drying methods for reduction the moisture content to a desirable level is presented in Table 2. The result suggested that the three (3) days were required for sun drying and ten (10) days required for shade drying to reach safe level of moisture content (10 $\pm$ 1%). Study on seed drying indicated that the germination of sundried hand threshed seeds was (87%) which is closely followed by stick beating (83%), machine-threshed 300 rpm (80%), 400 rpm (78%) and 500 rpm (70%). As against95% in hand-threshed, 90% in stick beating, 85% in machine-threshed 300 rpm 85% in 400 rpm and 78% in 500 rpm in shade dried seeds. In shade drying, low temperature minimizes scorching due to gradual loss of the moisture and there was no adverse effect on germinability of seeds. The result confirms the findings of Philpot, (1976), Patil and Zode, (1993), Lambat et al. (2011). In sun drying, high ambient temperature develop a rapid flow of moisture within the seeds causing stress and sun scorching to the embryo and cotyledons and this results in reduction of germinability with high number of abnormal seedlings and dead seeds. Morrison and Robertson, (1978), Sangakkara and Wanisekera, (1990), Patil and Zode, (1993). Seedling vigour index and field emergence percentage also followed the same trend of germination in mung. Similar results also reported by Saini et al. (1982) Patil and Zode, (1993) and Lambat et al. 2011

The apparent influence of threshing, drying methods and storage containers on germination, seedling vigour index and field emergence percentage of Mothbean seeds during storage presented in Table 3. The data indicated that the germination, seedling vigour and field emergence percentage of stored Mothbean declined with increasing storage period, however the rate of loss varied with the methods of threshing, drying and types of storage containers used. A sharp declined in germination, seedling vigour index and field emergence occurred in seeds threshed by machine 500 rpm, drying in sun and stored in jute, cloth and polyethylene bags during storage. However, there was practically less loss of germination, seedling vigour index and field emergence percentage in seeds threshed by hand dried in shade and stored in jute, cloth and polyethylene bags during storage for 9 months Sangakkara and Wanisekera, (1990), Patil and Zode, (1993) and Lambat et al. (2011) also reported that the sun drying of seeds harmful for germination. In the present study, it was observed that the Mothbean seed, stored in polyethylene bags were undergo the least amount of loss of germinability to great extent as compared to jute and cloth bags irrespective to threshing and drying method Vanangamudi, (1988), Shivankar et al. (1990), Likhitkar and Charjan, (1995) and Lambat et al. (2011) also reported superiority of polyethylene bags over jute and cloth bags for successful carry over of seed during storage. In the present study, the similar trends of germination were observed in seedling vigour index and field emergence percentage of Mothbean seeds during storage.

During this study (Table 4) it was evident that the maximum number of fungal colonies did develops in jute bags which are followed by cloth bags and polytheylene bags during storage. The polyethylene bags provided much protection as polyethylene bags resist moisture penetration which helps in preventing the development of fungal colonies both quantitative and species wise irrespective eto threshing and drying methods. It was also noted that *Alternaria* sp., *Aspergillu*s sp. *Fusarium* sp., *Penicillium* sp., *Rhizopus* sp. and *Trichothecium* sp. were the most commonly occurring fungi irrespective of storage periods and containers. The germinability of mung seeds decreased with increase in incidence percentage of fungal flora and storage period. The isolated fungi were most inhibitory to germination. The result obtained

were in conformity with the findings of Charjan and Gupta (1996) & Wankhede et al. (2010) and Lambat et al. (2011). It was also observed that the lower storage potential of mechanical damage seeds threshed by machine and sun dried may be because of higher rate of respiration and attraction of more fungal flora due to higher leaching of sugar which cause early reduction in germination, seedling vigour and field emergence (Burriga, 1961 and Lambat et al 2011)

Conclusion:

Thus, these results highlight the maintenance of Mothbean seed quality of sowing purposes in the next sowing reason for getting better yield. The mung pods should be threshed by hand or stick beating and dried in shade upto safe moisture level (10 ± 1 %) and stored in polyethylene bags, shows greater germinability, seedling vigour index and filed emergence and lesser invasion by fungal flora upto the next sowing season.

Table 1. Effect of threshing methods on mechanical damage to seed coat, sound seeds and germination percentage in Mothbean

Sr. No.	Threshing methods	Mechanically damaged seed (%)	Sound seed (%)	Germination Analysis %			Seedling Vigour Index	Field emergence (%)
				Normal seedling (%)	Abnormal Seedling (%)	Dead Seed (%)		
1	Hand – Threshing	0.2	99.8	96	2	2	1209	88
2	Stick Beating	103	98.6	91	5	4	1101	82
3	Machine-Threshing 300 rpm	1.6	98.4	84	12	6	1090	74
4	400 rpm	2.6	97.4	80	15	5	911	69
5	500 rpm	3.2	96.8	71	21	8	808	59
	SE (m) ±	0.2	0.2	1.5	n/a	n/a	68	1.2
	C.D at 5%	0.7	0.6	4.5	n/a	n/a	206	3.7
Germination % on the basis of normal seeding% (ISTA, 1985). SE (m) + Standard Error mean, C.D. at 5% Critical Difference at 5%.								

Table 2 : Effect of threshing and drying methods on germination percentage, seedling vigour index and field emergence percentage in Mothbean.

Sr. No	Threshing Methods	Shade drying					Sun drying				
		G.A. %					G.A. %				
		NS	ABS	DS	SVI	FE%	NS	ABS	DS	SVI	FE%
1	Hand – Threshing	95	3	2	1139	87	87	6	7	1099	78
2	Stick Beating	90	6	4	1003	80	83	10	7	1001	73
3	Machine-Threshing 300 rpm	85	9	4	979	78	80	14	6	7979	70
4	400 rpm	83	12	3	882	75	78	17	5	912	67
5	500 rpm	78	20	2	814	68	70	19	11	810	58
	SE (m) ±	1.2	N/A	N/A	50	1.2	1.2	N/A	N/A	55	1.3
	C.D at 5%	3.7	N/A	N/A	151	3.6	3.7	N/A	N/A	166	4.0
(G.A.- Germination analysis, NS-Normal Seedling, ABS- Abnormal seedling, DS-Dead seed, SVI Seedling vigour index, FE-Field emergence. SE (m) ± Standard Error mean, C.D. at 5% Critical Difference at 5%, Normal Seedling % = Germination%)											

Table 3. Effect of threshing, drying methods and storage containers on germination percentage, seedling vigour index, field emergence percentage in Mothbean during storage.

Sr. No.	Drying Methods/ Packing Methods	Germination %		Seedling Vigour Index		Field emergence %	
		Initial	9 Months	Initial	9 Months	Initial	9 Months
1	Hand threshed						
	1) Shade drying						
	i) Jute bag	95	89	1139	901	87	79
	ii) Cloth bag	95	91	1139	931	87	81
	iii) Polyethylene bag	95	93	1076	1102	87	83
	2) Sun drying						
	i) Jute bag	87	81	1099	812	78	71
	ii) Cloth bag	87	81	1099	812	78	71
	iii) Polyethylene bag	87	85	1099	897	78	75
	SE (m) +	N/A	2.5	N/A	44	N/A	2.4
2	Stick beating						
	1) Shade drying						
	i) Jute bag	90	83	1003	872	80	66
	ii) Cloth bag	90	81	1003	821	80	68
	iii) Polyethylene bag	90	88	1003	996	80	75
	2) Sun drying						
	i) Jute bag	83	74	1001	801	78	63
	ii) Cloth bag	83	75	1001	792	78	64
	iii) Polyethylene bag	83	80	1001	962	78	70
	SE (m) +	N/A	2.9	N/A	43	N/A	3.0
3	Machine-threshed (300 rpm)						
	1) Shade drying						
	i) Jute bag	85	72	979	840	78	61
	ii) Cloth bag	85	74	979	856	78	63
	iii) Polyethylene bag	85	81	979	969	78	71
	2) Sun drying						
	i) Jute bag	80	64	979	814	70	54
	ii) Cloth bag	80	66	979	821	70	55
	iii) Polyethylene bag	80	75	979	901	70	65
	SE (m) +	N/A	3.2	N/A	46	N/A	4
4	Machine-threshed (400 rpm)						
	1) Shade drying						
	i) Jute bag	83	65	882	701	73	54
	ii) Cloth bag	83	66	882	711	73	54
	iii) Polyethylene bag	83	74	882	804	73	64
	2) Sun drying						
	i) Jute bag	78	67	912	712	68	55
	ii) Cloth bag	78	68	912	720	68	55
	iii) Polyethylene bag	78	73	912	801	68	63
	SE (m) +	N/A	3.0	N/A	42	N/A	2.8
5	Machine- Threshed (500 rpm)						
	1) Shade drying						
	i) Jute bag	78	61	814	702	68	51
	ii) Cloth bag	78	63	814	704	68	52
	iii) Polyethylene bag	78	69	814	799	68	60
	2) Sun drying						
	i) Jute bag	70	50	810	627	58	38
	ii) Cloth bag	70	53	810	640	58	41
	iii) Polyethylene bag	70	60	810	708	58	50
	SE (m) +	N/A	3.5	N/A	57	N/A	3
SE (m) $\pm$ Standard Error mean,(Normal seedling % = Germination%)							

Table 4. Effect of threshing, drying methods and storage containers on incidence percentage of fungal flora on Mothbean during storage.

Sr. No.	Treatments	Percentage of fungi encountered on Mothbean seeds											
		A		B		C		D		E		F	
		1	2	1	2	1	2	1	2	1	2	1	2
1	Hand Threshed												
	1) Shade drying												
	i) Jute bag	1	5	3	12	1	5	1	18	N/A	4	N/A	1
	ii) Cloth bag	1	4	3	10	1	5	1	22	N/A	5	N/A	N/A
	iii) Polythylene bag	-	1	2	5	1	1	1	3	N/A	2	N/A	N/A
	2) Sun Drying												
	i) Jute bag	1	5	2	15	N/A	7	N/A	10	N/A	5	N/A	1
	ii) Cloth bag	1	5	2	16	N/A	8	N/A	16	N/A	5	N/A	1
	iii) Polythylene bag	1	3	2	7	N/A	1	N/A	12	N/A	2	N/A	N/A
2	Stick beating												
	1) Shade drying												
	i) Jute bag	2	6	2	15	N/A	8	1	24	1	7	N/A	2
	ii) Cloth bag	2	7	2	16	N/A	9	1	20	1	9	N/A	1
	iii) Polythylene bag	2	1	2	10	N/A	4	1	10	1	2	N/A	N/A
	2) Sun Drying												
	i) Jute bag	1	4	2	20	N/A	10	N/A	20	N/A	3	N/A	1
	ii) Cloth bag	1	4	2	14	N/A	9	N/A	24	N/A	4	N/A	2
	iii) Polythylene bag	N/A	N/A	2	8	N/A	2	N/A	14	N/A	N/A	N/A	N/A
3	Machine-threshed (300 rpm)												
	1) Shade drying												
	i) Jute bag	1	5	3	18	1	8	1	27	1	9	N/A	N/A
	ii) Cloth bag	1	6	3	16	1	5	1	24	1	8	N/A	N/A
	iii) Polythylene bag	1	1	3	9	1	1	1	12	1	2	N/A	N/A
	2) Sun Drying												
	i) Jute bag	1	5	3	20	N/A	6	1	24	N/A	18	N/A	N/A
	ii) Cloth bag	1	5	3	18	N/A	4	1	14	N/A	15	N/A	N/A
	iii) Polythylene bag	N/A	1	3	10	N/A	N/A	1	8	N/A	2	N/A	N/A
4	Machine–threshed (400 rpm)												
	1) Shade drying												
	i) Jute bag	1	6	3	27	1	14	1	24	1	9	N/A	1
	ii) Cloth bag	1	6	3	19	1	9	1	19	1	8	N/A	2
	iii) Polythylene bag	1	1	3	16	1	1	1	2	1	2	N/A	N/A
	2) Sun Drying												
	i) Jute bag	1	6	2	31	N/A	19	N/A	25	N/A	10	N/A	2
	ii) Cloth bag	1	5	2	29	N/A	14	N/A	19	N/A	10	N/A	2
	iii) Polythylene bag	0	N/A	2	18	N/A	5	N/A	3	N/A	3	N/A	N/A
5	Machine-threshed (500 rpm)												
	1) Shade drying												
	i) Jute bag	1	6	3	27	1	19	1	30	1	15	N/A	N/A
	ii) Cloth bag	1	5	3	21	1	12	1	25	1	10	N/A	1
	iii) Polythylene bag	1	2	3	12	1	12	1	15	1	2	N/A	N/A
	2) Sun Drying												
	i) Jute bag	1	5	2	28	1	19	1	34	N/A	15	N/A	1
	ii) Cloth bag	1	4	2	20	1	12	1	29	N/A	9	N/A	2
	iii) Polythylene bag	N/A	N/A	2	10	1	7	1	11	N/A	2	N/A	N/A
	Total	29	106	65	318	15	150	21	424	12	155	0	20

A-*Alternaria* sp., B. *Aspergillus* sp. C- *Fusarium* sp., D-*Peicillium* sp., E-*Rhizopus* sp. And F- *Trichothecium* sp.,
1-Standard blotter paper method test, 2- Agar plate method.

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