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Scientific validation of ITK oil to protect pulses from storage pests

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Abstract

The post harvest damage has huge quality losses in food grains combined with economic losses due to infestation of insect-pests. This damage may be due to direct feeding of grains by insect and pests or microbial agent like fungi and bacteria. Experiment were carried out in two phase i.e. September to January and March to July. Three pulses viz lentil, black gram and green gram have been taken with three treatments i.e. control, with 3 drop and with 5 drops oil per Kg whole pulse and splitted pulse. Perceptible effect of application of mustard oil in controlling storage pests of green gram, black gram and lentil was observed from the experimental results, thus corroborating the ITK practice. Damage were seen only in 5 cases out of 60 in pulses where 3 drops of mustard oil were applied per kg grains. Similarly where 5 drops were applied the damage was found in 3 samples out of 60. The results indicate that application of mustard oil reduced the insect attack in stored pulses. It can also be said that 3 to 5 drops of oil may be applied in pulses.

Keywords: ITK, Pulses, Mustard Oil, Grains

Introduction

Mustard oil and Til oil repel the insects. A little quantity of mustard oil or Til oil is mixed with pulse grains while storing. This protects the pulses from storage pests. This costs Rs. 20-25 per quintal pulse grain. There acute problems of different kinds of insect-pests during the pulses while stored in Kitchen for more than 2 months, especially during rainy as well as summer season. The pulse grain is eaten by the insect and is turned into powder (Kanwar and Sharma 2003) [3]. The problem is more acute where humidity and temperature are more. Farm women sometimes use poison bait or capsule purchased from the market. The villagers, however, felt this could have made the pulse poisonous for human consumption. In view of this, mostly the villagers used to adopt ITK for storage of pulse grains for home consumptions (Channal *et al.* 2004 an Nagaur *et al.* 2006) [2, 8].

Methodology

Experiment was carried out for scientific validation of Indigenous Traditional Knowledge (ITKs) use of oil to protect pulses like green gram, black gram, etc. from storage-pests. To quantify the efficacy of ITK through matrix ranking of PRA techniques, 20 kg infants were asked to score three treatments *viz.* control, after 2 months, and after 3 months. They were asked to rate and put scores out of 10 on five criteria i.e. free from insects, weight, appearance, cooking quality and keeping quality. Matrix table have been prepared after calculating the average score for 20 kg informants for each column. The data were given to ANOVA test for significance of difference.

Research work for scientific validation have been carried out in five villages of Kanpur i.e. Ramel Nagar, Baikunthpur, Chiran, Bharatpur and Pratapur Hari in two phases, once during winter season and the during summer season. Experiment was carried out in whole grain as well as splitt grain in RBD with 5 replications. The three treatments were control (T₁), two drops of mustard oil (T₂) mixed with pulse and 5 drop of mustard oil (T₃) mixed with per kg of pulse. First observation was recorded after two months and second after four months.

Results and Discussion

Data observed in first phase that there was no damage when mustard oil was applied at 5 drops per kg. However damage was found when only 2 drops per kg pulse carried out during summer season had the modified treatments such as control, 3 drops of oil and 5 drops oil

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mixed with 1 kg each of pulse grains. In all 5 replications were used in five villages, two experiment in each village during second phase also.

The results of matrix ranking by 20 key information's on five criteria for four treatments are summarised in Table-1.

Table 1: PRA matrix on efficacy of oil in storage of grains (maximum score 10).

Criterion	Treatment				
	Control (After 2 months)	Control (After 3 months)	After 2 months application of oil	After 3 months application of oil	Significance of difference
Free from insects	7.25	4.75	9.80	9.25	**
Weight	7.90	6.38	9.85	9.50	**
Appearance	7.30	5.75	9.73	9.35	**
Cooking quality	9.35	8.60	9.70	9.50	**
Keeping quality	7.80	5.75	9.70	8.95	**
Average	7.83	6.39	9.75	9.30	**

**Significant at 0.01 percent

Data of the 1st phase (September to January) have been recorded and presented in Table-2.

Data of table-2 revealed that after 2 months, the stored grain pests were observed in 26 samples out of 180 samples, out of which 21 samples belong to control treatments, where oil was not applied. Among 21 samples, 14 samples were of whole grain (black gram 5, green gram 5 and lentil 4), whereas 7 sample were of split pulse (lentil 4, black gram 1 and green

gram 1). Five samples of whole pulse treated with two drops of mustard oil were observed having few insects. In none of the samples, treated with 5 drops of oil, the insect was observed. Populations of insects were found minimum in the month of October to January due to low temperature. In 100 grams grains 1 to 4 grains was found damage after two months of observation and weight loss was found 40g to 100g in 1 kg pulse (Table-3).

Table 2: Effect of application of mustard oil while preserving pulse grains (observations taken after 1 month) Phase-I

Replication /pulse	Whole pulse (grain)						Splitted Pulse (Dali dal)					
	Control		2 drops		5 drops		Control		2 drops		5 drops	
	No of damaged grains/100	Weight loss(g)	No of damaged grains/100	Weight loss(g)	No of damaged grains/100	Weight loss(g)	No of damaged grains/100	Weight loss(g)	No of damaged grains/100	Weight loss(g)	No of damaged grains/100	Weight loss(g)
Lentil	3	75	1	20	-	-	3	50	-	-	-	-
	3	60	-	-	-	-	4	50	-	-	-	-
	4	90	1	25	-	-	4	60	-	-	-	-
	3	65	-	-	-	-	2	25	-	-	-	-
Blackgram	4	95	-	-	-	-	2	15	-	-	-	-
	5	100	2	40	-	-	1	25	-	-	-	-
	4	70	-	-	-	-	-	-	-	-	-	-
	4	80	-	-	-	-	-	-	-	-	-	-
Greengram	5	95	1	25	-	-	-	-	-	-	-	-
	3	75	-	-	-	-	-	-	-	-	-	-
	3	60	-	-	-	-	-	-	-	-	-	-
	2	40	-	-	-	-	-	-	-	-	-	-
Green gram	3	65	-	-	-	-	-	-	-	-	-	-
	4	80	1	25	-	-	2	20	-	-	-	-

Table 3: Effect of application of mustard oil while preserving pulse grains (observations taken after 4 month) Phase-I

Replication /pulse	Whole pulse (sabut)						Splitted Pulse (dali dal)					
	Control		2 drops		5 drops		Control		2 drops		5 drops	
	No of damaged grains/100	Weight loss(g)	No of damaged grains/100	Weight loss(g)	No of damaged grains/100	Weight loss(g)	No of damaged grains/100	Weight loss(g)	No of damaged grains/100	Weight loss(g)	No of damaged grains/100	Weight loss(g)
Lentil	7	150	4	75	-	-	4	75	-	-	-	-
	5	100	1	2	-	-	-	-	-	-	-	-
	6	125	-	-	-	-	3	75	-	-	-	-
	9	200	3	40	-	-	6	90	-	-	-	-
	4	90	-	-	-	-	3	50	-	-	-	-
Black gram	8	200	-	-	-	-	2	25	-	-	-	-
	9	250	4	60	-	-	4	30	-	-	-	-
	8	200	-	-	-	-	2	20	-	-	-	-
	9	200	-	-	-	-	2	30	-	-	-	-
	12	300	3	40	-	-	-	-	-	-	-	-
Green gram												

	6	150	2	25	-	-	2	25	-	-	-	-
	5	100	-	-	-	-	-	-	-	-	-	-
	5	125	3	50	-	-	2	20	-	-	-	-
	6	160	-	-	-	-	-	-	-	-	-	-
	8	175	2	25	-	-	3	40	-	-	-	-

It was expected that once the insect has come, it will grow fast. But the growth was not very much perhaps due to low temperature. The results, however, indicated about 25% loss in two cases of black gram in 4 months (Mann *et al.* 2014). Loss was found less in weight of split pulse. The attack of

insect was also reduced (7 samples in 2 months 11 samples in 4 months). Data of the table 2 and 3 also revealed that insect attack was more in black gram and followed by green gram and minimum in lentil (Natvajan and Govind, 2006) ^[10].

Table 4: Effectiveness of mustard oil in controlling storage pests of lentil, black gram and green gram (observations taken after 2 months) Phase-II

Replication/ pulse	Whole pulse						Split pulse					
	Control		3 drops		5 drops		Control		3 drops		5 drops	
	DG/100	WL	DG	WL	DG	WL	DG	WL	DG	WL	DG	WL
Lentil	18	160	-	10	-	10	6	60	-	10	-	10
1	7	65	-	15	-	15	5	45	-	10	-	10
2	7	70	-	10	-	15	5	40	-	5	-	15
3	7	70	-	10	-	15	5	40	-	5	15	-
4	9	90	-	20	-	10	4	30	-	10	-	15
Black Gram												
1	20	185	10	115	-	10	7	60	-	10	-	10
2	11	110	-	10	-	10	6	55	-	15	-	10
3	18	180	-	10	-	15	5	40	-	10	-	5
4	9	85	-	15	-	10	4	30	-	10	-	5
Green Gram												
1	20	200	25	230	32	300	12	110	-	15	15	150
2	11	115	-	10	-	20	6	55	-	10	-	10
3	14	125	-	15	-	10	5	40	-	5	-	5
4	16	150	-	10	-	10	5	40	-	5	-	5
5	12	120	-	20	-	20	4	30	-	5	-	5
6	-	15	-	10	-	10	6	45	-	5	-	5

DG, Damaged grain/100 grains: WL, weight loss/kg.

Data of second phase (March-July) were recorded and presented in Table-4. It was found that out of 180 samples, 30 samples were found infected out of which 27 samples belong

to control treatment. We can say 50% of the control treatment indicated damaged after 2 months due to insect-pests.

Table 5: Effectiveness of mustard oil in controlling storage pests of lentil, black gram and green gram (observations taken after 4 months)

Replication/ pulse	Whole pulse						Split pulse					
	Control		3 drops		5 drops		Control		3 drops		5 drops	
	DG/100	WL	DG	WL	DG	WL	DG	WL	DG	WL	DG	WL
Lentil												
1	28	255	4	40	-	20	12	150	-	15	-	15
2	18	165	1	10	-	10	10	115	-	15	-	15
3	22	210	-	20	-	20	9	100	-	20	-	10
4	18	155	-	15	-	15	10	85	-	20	-	10
5	27	260	-	15	-	15	16	150	-	18	-	10
6	17	165	-	10	-	10	-	10	-	15	-	10
Black Gram												
1	28	260	5	35	-	15	22	200	-	15	-	10
2	22	210	-	10	-	10	21	210	-	20	-	10
3	22	215	-	10	-	10	16	150	-	15	-	10
4	18	150	-	15	-	15	17	150	-	16	-	15
5	20	195	-	10	-	10	12	100	-	16	-	15
6	20	160	-	15	-	15	-	15	-	20	-	15
Green Gram												
1	28	250	6	320	42	450	26	250	20	200	20	200
2	22	210	5	60	-	15	12	200	-	15	-	10
3	26	270	-	15	-	10	16	150	-	15	-	15
4	32	360	-	15	-	10	23	200	-	15	-	10
5	38	380	-	10	-	15	22	190	-	20	-	10
6	28	260	-	15	-	10	20	175	-	18	-	15
7	32	300	-	10	-	15	20	150	-	18	-	10

DG, Damaged grain/100 grains: WL, weight loss/kg.

In the samples of whole pulse grain which were observed to have the presence of insect after 2 months, the damage was 10 to 18 grains/100 grains. Similarly, the weight loss in whole pulse grain ranged from 85-200g whereas the loss in splitted pulse grain was 30 to 60 g/kg (Chahal, 2011; Kavita *et al.* 2013) ^[1, 5].

After 4 months the damage was increased to 45 samples out of 180. Out of which 36 samples belonged to control treatment where oil was not applied. Damage was found were in green gram (Table-5). It was 25-30 grains/100 and weight loss was 200-300 g per kg. weight loss exhibited range of variations from 150-260 g (15-20 grains per 100) in lentil and black gram. (Narang 2003, Manju *et al.* 2007 and Karthikeyan *et al.* 2009) ^[9, 6, 4] also found similar results in their investigations.

It was found that application of mustard oil reduced the insect attack in stored pulses. Use of 3-5 drops of oil may be applied in pulses.

The results observed revealed that:-

- The villagers considered that pulse treated with oil had the best protection from stored grain pests.
- Weight loss was the highest in untreated pulse after 3 months, but was least in treated pulse after 2 months or even 3 months.
- Pulse in appearance remained as such when treated with oil, but got spoiled in appearance when oil was not applied.
- Cooking quality did not change much except in control treatment after 3 months.
- Keeping quality of pulse was best when treated with oil and it was worst when not treated.

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