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Short Research Article

Evaluation of Farmers Saved Seed of Green Gram and Chickpea in Munger District of Bihar

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Abstract

An investigation was conducted in 60 rural households of 8 villages viz, Pouria, Durgapur, Sangrampur, Jala, Supoor Jamua, Kendua, Khapra and Jhikli located within a range of 10 km to assess the seed quality of farmers saved seed of green gram and chickpea, in Munger district of Bihar during 2014−15. The seed sample were collected from the farmers saved seed stored under different container for estimation of seed quality attributes such as seed moisture content, physical purity, germination percent and seed health. It was found that seed storage as well as the quantity of the storage decided the type of the container and their storage methods. The commonly used methods and containers are Polythene bag, Metal container and Jute bag. The polythene bag were found most common storage container for green gram where as for chickpea more than 50% farmers prefers metal container. It was found that only 23.33% farmer treated the green gram whereas number was more in case of chickpea (53.33%) for storage. The germination percent of twenty out of thirty sample of green gram and all fifteen samples of chickpea maintained the prescribed IMSCS standard. The storage of farmer saved seed of both crops was not satisfactory with regard to seed moisture content and insect pest infestation. The current evidence on farmer's seed samples indicated that storage methods and seed quality parameters need to be improved to increase yield.

1. Introduction

Seed is the vital inputs for enhancing the productivity of agriculture. It is the critical, basic and the most affordable input. The use of quality seeds with desirable seed replacement rate is essential for growth in agricultural productivity which can alone increase the crop yield upto 20−25%. The timely availability of quality seed at reasonable price where it required, determines the agricultural productivity of the state. Of the total seed requirement in the country, only less than 20% good quality certified seeds are available to the farmers and more than 80% of the requirement is met up by farmers saved seed (Atwal, 2013). Kumar et al., 2014 reported that quality of farmers saved seed is below standard. Despite high potentiality available in the state for pulse production, we have not achieved the desirable level and farmers are using their own saved seed resulting in low production as well as productivity of pulses.

The quality of seeds is determined by its genetic purity, physical purity, germination percentage, moisture content, seed health and storage condition. The high level of physical purity is essential to establish a sufficient plant stand, directly affecting the yield (Mc Guire, 2005). The farmers in many of the developing countries use the saved grains as seeds for sowing which are not assessed for their planting value (Mathur and Talukder, 2002). Kumar et al., 2013 reported that inferior seed health, germination and vigour may be improved for next generation of farmers produced seed through imparting seed producing and seed storing skills to the farmers.

It is also very important that quality seed should be packed and stored in controlled conditions otherwise deterioration of seed occurs which leads to lower in planting value. Variation in temperature and relative humidity during storage may affect the seed vigour and viability causes poor germination and field establishment. In the humid tropical countries, the high relative humidity of the storage environment leads to an increase in moisture content which in combination with high ambient temperatures; results in rapid deterioration leading to a decline in seed vigor and ultimate loss of viability. Poor storage conditions have been reported to cause 10% loss in seed quality in the tropics (Genchev, 1997).

In India, farmers generally stores seed in gunny bags and kept in wooden plank in the room for sowing in next season without much care during storage periods subjected to attack by the insect pest. Low seed moisture content and storage temperature slows down the rate of aging (Coolbear, 1995). Roberts (1973) further stated that viability of seeds in storage increases with decrease in seed storage moisture and temperature. When the moisture content is high (>30%), non-dormant seeds may germinate, and from 18−30% moisture content rapid deterioration by micro-organisms can occur (Ellis et al., 1990).

According to the FAO report (2004) that in developing countries, the greatest losses during storage to cereals and other durable commodities such as pulses and oilseeds, are caused by insect pests. Hence, the present investigation was undertaken to study the quality of farmers saved legume seed stored under different locally available containers under ambient conditions in Munger district of Bihar.

2. Materials and Methods

2.1. Study sites

A survey was carried out in 60 rural households of eight villages viz., Pouria, Durgapur, Sangrampur, Jala, Supoor Jamua, Kendua, Khapra and Jhikli a located within a range of 10 km Munger district of Bihar state during year 2014−15. Seeds of green gram and chickpea which were stored for sowing purpose by farmers, were sampled (ISTA, 2003) for estimation of seed moisture content, physical purity, germination percent and seed health. A total of 45 samples from two legume crops viz. Green gram (30) and Chickpea (15) were collected. During the survey, a framed questionnaire also distributed for collection of information on on variety cultivated, storage methods, storage period and stored pest management practices adopted by farmers.

2.2. Seed analysis

The purity analysis was carried out on the working sample made from samples collected from farm households. The analysis of seed samples was done as per ISTA (2003) rules and procedures for purity analysis, moisture content (%), germination (%), shoot length (cm), root length (cm), vigour indexI, dry matter production, vigour index II, insect damaged seeds and storage environment.

2.2.1. Germination (%)

Eight replicate of 50 seed each variety and each treatments were tested for germination studies as per ISTA method.

2.2.2. Abnormal seedling (%)

The entire damaged, decayed and deformed seedlings which were not able to produce normal seedling were counted and considered as abnormal seedling.

2.2.3. Total seedling length (cm)

Ten normal seedlings were taken at random from each replication and shoot and root lengths of each seedling were measured. The mean value was taken for analysis**.**

2.2.4. Seedling dry weight (mg)

Ten normal seedlings were taken at random from each replication for observing seedling length were dried in hot air oven maintained at 70±1 °C for 48 hr and cooled in dessicators. The mean value of seedling dry weight was taken for analysis.

2.2.5. Vigour index I and II

The vigour indices were computed by adopting the method of Abdul Baki and Anderson (1973) by using following formula:

Vigour Index I=Germination (%) *Total Seedling Length (cm)

Vigour Index II=Germnation (%) *Seedling Dry Weight (mg)

The major factor affecting the storability of the seed was the temperature and relative humidity of the storage environment, though, farmers stored the seed under prevailing weather conditions.

3. Results and Discussion

3.1. Evaluation of seed storage practices

The results of survey of 15 chickpea and 30 green gram sample revealed that types of container and seed treatment for storage determines the quality of seed of farmers saved seed. The commonly used methods and containers are metal container, polythene bag and jute bags mentioned in Table 1.

The polythene bag were found most common storage container

Table 1: Storage and seed management practices in farmer's saved seeds of legume

Name of crop	Storage method	No. of sample	Seed treatment	No. of treated sample	Treatment
Green gram	Polypropylene bag	18	Neem leaf and Celphos	Nil	Nil
	Plastic pot (container)	5		1	3.33%
	Metal container	4		4	13.33%
	Jute bag	3		2	6.66%
	Total	30		7/30	23.33
Chickpea	Metal container	6	Neem leaf and Celphos	4	26.66
	Poly propylene bag	5		2	13.33
	Jute bag	4		2	13.33
	Total	15		8/15	53.33

for green gram where as for chickpea more than 50% farmers prefers metal container. The seed treatment with dried neema leaf and celphos were also practiced by farmer for maintaining the quality of household seed for sowing in next season. It was found that only 23.33% farmer treated the green gram whereas number was more in case of chickpea (53.33%) for storage. The practice of storing the seeds of legumes is supposed to have protection against storage insect particularly pulse beetle (*Callasobruchus chinensis*).

3.2. Evaluation of seed quality of farmer's saved seed

3.2.1. Green gram

Twenty out of 30 samples of farmers saved seeds could maintain the prescribed minimum seed standards above 75%. The germination percentage of green gram samples ranged between 70 to 95% with a mean value of 85.5%. The sample with lowest germination of 70% recorded lowest vigour index I values (1498) and vigour index II values (12.91) which clearly suggests the inferior quality of the seed lot. The mean value for the vigour index I was 2095 and vigour index II 18.05. Out of 30 samples, only one samples have minimum physical purity of 98% with a mean value of 94.78%. Maximum and minimum inert matter was found in sample no 6(10.5) and sample no. 12 (1.9%) respectively. Mean seed test weight for 30 samples is 3.14 g (Table 2 and 3).

One fifth of the seed sample were found to have maintained the moisture content within the safe moisture level of 9%, but overall mean is 9.36%. Average insect attack for the 30 samples was found 0.98% which was mostly due to infestation of *Callosobruchus chinensis.*

3.2.2. Chickpea

All 15 samples of farmers saved seeds could maintain the prescribed minimum seed standards above 85%. The germination percentage of gram samples ranged between 90 to 96% with a mean value of 93%. The sample no 7 and 13 recorded lowest germination percent.

The highest and lowest vigour index I were recorded in sample no 12 (2755.2) and sample no. 5 (2187) respectively. Where as, vigour index II were found highest in sample no 12 (130) and lowest in sample no 7 (96) (Table 4 and 5).

It was found that none of the samples having minimum physical purity of 98% with a mean value of 93.8%. The average inert matter in the sample was 6.2%. The seed moisture content in all the sample were found more than prescribed moisture content of 9%. It was also reported that all 15 sample were infested with insect (*Callosobruchus chinensis*) The highly infested sample was sample 5 (4.9%).

Table 2: Physiological seed quality of farmers saved green gram seed

Lots	Germination (%)	SL (cm)	RL (cm)	Seedling length (cm)	VI I	DMP (g seedlings-10)	VI II
1.	92	14.8	11.2	26	2392	0.22	20.61
2.	90	14.4	10.9	25.3	2277	0.22	19.62
3.	89	14	10.7	24.7	2198.3	0.21	18.94
4.	88	13.8	10.7	24.5	2156	0.21	18.57
5.	90	13.9	10.8	24.7	2223	0.21	19.15
6.	85	13.9	10.4	24.3	2065.5	0.21	17.80
7.	91	14.7	11.1	25.8	2347.8	0.22	20.23
8.	93	15.2	11.6	26.8	2492.4	0.23	21.47
9.	89	13.8	10.7	24.5	2180.5	0.21	18.79
10.	80	13.1	9.9	23	1840	0.20	15.85
11.	86	13.4	10	23.4	2012.4	0.20	17.34
12.	86	13.7	10.1	23.8	2046.8	0.21	17.63
13.	92	14.2	10.9	25.1	2309.2	0.22	19.89
14.	95	15.2	12	27.2	2584	0.23	22.26
15.	88	13.7	10.7	24.4	2147.2	0.21	18.50
16.	79	13.2	9.9	23.1	1824.9	0.20	15.72
17.	76	12.5	9.2	21.7	1649.2	0.19	14.21
18.	80	13.4	10.1	23.5	1880	0.20	16.20
19.	80	12.7	10.3	23	1840	0.20	15.85
20.	78	12.6	10.1	22.7	1770.6	0.20	15.25
21.	78	12.8	9.7	22.5	1755	0.19	15.12
22.	89	14.1	10.6	24.7	2198.3	0.21	18.94
23.	91	14.8	11.2	26	2366	0.22	20.38
24.	90	15.2	10.9	26.1	2349	0.22	20.24
25.	89	13.5	10.9	24.4	2171.6	0.21	18.71
26.	75	13	9.6	22.6	1695	0.19	14.60
27.	70	12.7	8.7	21.4	1498	0.18	12.91
28.	90	13.6	10.9	24.5	2205	0.21	19.00
29.	92	14.8	11	25.8	2373.6	0.22	20.45
30.	84	13.7	10.2	23.9	2007.6	0.21	17.30
Mean	85.83	13.81	10.5	24.31	2095.1	0.21	18.05
SEm±	0.92	0.17	0.12	0.27	28.73	0.01	0.22
CD (p =0.05)	2.6	0.5	0.3	0.8	81.3	NS	0.6

SL: Shoot length; RL: Root length; VI: Vigour index II

Table 3: Physical purity, test weight and moisture content of farmers saved seeds of green gram

Lots	Physical Purity (%)	Inert matter (%)	100 seed wt (g)	Moisture (%)	Embryo damaged seeds (%)	Insect Attacked seeds (%)
1.	94.30	5.7	3.13	8.98	1	0
2.	95.00	5	3.45	8.99	0	0
3.	96.80	3.2	3.34	9.1	2	1
4.	92.80	7.2	3.43	8.84	3	0
5.	90.10	9.9	3.22	8.98	1	1
6.	89.50	10.5	3.18	9.3	1	0
7.	94.50	5.5	3.25	9.11	1	0
8.	93.48	6.52	3.34	8.99	2	0
9.	94.18	5.82	3.17	9.32	1	0
10.	96.77	3.23	3.08	9.22	3	0
11.	96.57	3.43	2.98	9.02	3	0
12.	92.41	7.59	3	9.32	4	0
13.	94.80	5.2	3.44	8.94	1	0
14.	96.44	3.56	3.01	9.19	4	0
15.	95.93	4.07	3.26	9.36	3	0
16.	94.52	5.48	3.32	9.68	5	2.1
17.	96.91	3.09	3.22	9.78	3	1.4
18.	97.7	2.3	3.18	9.04	2	0
19.	98.09	1.91	2.94	9.39	4	1.05
20.	97.44	2.56	3.06	10	3	3.3
21.	96.95	3.05	2.89	9.89	2	2
22.	97.49	2.51	3.11	9.66	4	2.1
23.	95.02	4.98	3.03	9.48	2	1.22
24.	96.45	3.55	3.01	9.1	2	1.12
25.	94.00	6	2.99	9.04	1	1.3
26.	93.5	6.5	2.89	9.43	4	2.3
27.	95.6	4.4	3.1	10.04	3	3.4
28.	90.00	10	3.34	9.89	4	1.17
29.	89.00	11	3.06	9.67	3	2.1
30.	97.44	2.56	3.03	10.3	6	3.1
Mean	94.78	5.21	3.14	9.36	2.6	0.98
SEm±	1.06	1.06	0.04	0.10	0.03	-
CD (p =0.05)	3.0	3.0	0.1	0.3	0.1	-

Table 4: Physical purity, test weight and moisture content of farmers saved chickpea seeds

Lots	Germination (%)	SL (cm)	RL (cm)	Seedling length (cm)	VI I	DMP (g seedlings^{-10})	VI II
1.	95	11.2	17.4	28.6	2717	1.350	128.3
2.	92	11.3	17.1	28.4	2612.8	1.341	123.3
3.	94	11.5	14.5	26	2444	1.227	115.4
4.	95	12.1	15.4	27.5	2612.5	1.298	123.3
5.	90	10.2	14.1	24.3	2187	1.147	103.2
6.	91	10.9	12.9	23.8	2165.8	1.123	102.2
7.	90	10	12.6	22.6	2034	1.067	96.0
8.	91	12	13.3	25.3	2302.3	1.194	108.7
9.	93	12.1	13.9	26	2418	1.227	114.1
10.	95	13.2	14.8	28	2660	1.322	125.6
11.	96	13.3	15.3	28.6	2745.6	1.350	129.6
12.	96	13.2	15.5	28.7	2755.2	1.355	130.1
13.	90	10.9	14.3	25.2	2268	1.190	107.1
14.	93	12.3	15.2	27.5	2557.5	1.298	120.7
15.	92	12.1	14.8	26.9	2474.8	1.270	116.8
Mean	93	12	15	26	2464	1	116
SEm±	1.07	0.11	0.11	0.31	19.64	0.01	1.32
CD (p =0.05)	3.1	0.3	0.3	0.9	56.9	NS	3.8

Table 5: Physical purity, test weight and moisture content of farmers saved seeds of chickpea

Lots	Purity (%)	Inert matter (%)	100 seed wt (g)	Moisture (%)	Embryo damaged seeds (%)	Insect attack (%)
1.	94.4	5.6	14.32	10.1	1	2.1
2.	95.5	4.5	14.8	10.16	2	2.3
3.	93.45	6.55	13.89	9.97	1	3.4
4.	94.8	5.2	15.12	10.7	0	1.5
5.	90.88	9.12	13.99	11.15	2	4.9
6.	94.5	5.5	14.54	10.28	1	2.2
7.	93	7	13.99	10.57	1	3.4
8.	95.4	4.6	14.54	10.42	0	1.2
9.	95.2	4.8	15.99	10.07	0	1.1
10.	91.6	8.4	13.88	10.97	2	3.1
11.	90.3	9.7	15.53	10.7	1	5.2

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Lots	Purity (%)	Inert Matter (%)	100 seed wt (g)	Mois-ture (%)	Embryo damaged seeds (%)	Insect attack (%)
12.	92.71	7.29	14.98	10.42	1	4.7
13.	95.86	4.14	13.8	9.8	1	1.1
14.	94.04	5.96	14.68	10.1	1	2.4
15.	95.36	4.64	14.7	9.94	0	1.6
Mean	93.8	6.2	14.6	10.4	0.9	2.7
SEm±	1.40	0.07	0.17	0.13	0.02	0.03
CD (p=0.05)	NS	0.2	0.5	0.4	0.1	0.1

4. Conclusion

For this, fourty five samples were collected, thirty for green gram and fifteen for chickpea from Munger district of Bihar. It was found the farmers mostly prefer polythene bag for grren gram and metal container for chickpea storage under ambient condition. Under one year of storage we found that germination percent remains maintained above prescribed standard of IMSCS, but seed moisture content and level of insect pest infestation were beyond standard. The evidence indicated that farmers saved seed under mentioned storage practices were need to be improved to maintain seed quality.

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