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Assessment of seed quality and storage methods of farmers' saved cereal seeds in Jhansi district

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ABSTRACT A survey was conducted during 2008 to assess the seed quality and storage methods followed by famers in Jhansi district of Uttar Pradesh. The seed samples of cereal crops representing the routine cropping pattern practiced by the farmers *viz.*, wheat and maize were collected from 51 rural households of nine villages, namely Baratha, Kochhabhnabar, Karnguwanji, Parichha, Karari, Padari, Jamaura, Jauhari and Chirgnaw located within a range of 30 km of Jhansi district. The seeds stored for sowing purpose were randomly sampled using standard sampling procedures from farm households to estimate the different seed quality parameters. The type of storage method and container was decided on the basis of farmer's requirements, quantity of seed and storage period. The commonly used seed storage methods/ containers included polythene lined urea bag, jute bag, room storage, bunnda, metal container, plastic container and mud pot.

Keywords: Seed quality, storage methods, farmers' saved seed, wheat, maize

Seed is considered as a basic input for agricultural development as it ensures grain production and adds new genetic resource to the total crop gene pool. The productivity of the crop is directly linked to quality of the seed used, though management practices and supplementary inputs exert profound influences [1]. It is estimated that the direct contribution of quality seed alone to total production is 15-20%, which can be further raised up to 45% through efficient management of other inputs. Farmers have successfully maintained their indigenous verities over the years by keeping household seed stocks, obtaining seeds through traditional family or community network and through exchanges with nearby communities [2]. Farmers have been using their own saved seeds for cultivation, without completely knowing its quality status and thus incurring frequent losses. It is estimated that about three quarters of the farmers worldwide save seeds from their harvest routinely for sowing [3]. In India, fragmented land holdings and the lack of adequate inputs force the farmers to use farm saved seeds. Low productivity across the major agricultural crops is attributed to the tendency of the Indian farmers to use farm saved seeds. At present, only 12% of the seed used for sowing in India is certified and the rest is farmers' saved seed [4-5]. Though minimum standards for seed quality have been prescribed in India [6], farmers are not yet aware of these standards.

The use of sub-standard and inferior quality seed results in lower plant population per unit area. Though a lot of information by researchers has been provided on different aspects of seed quality, but necessary care taken for the maintenance and improvement of the seed quality is generally neglected, especially at farmer's level [7]. Since the majority of farmers use their own saved seeds for cultivation, it was considered necessary to investigate the seed quality of farmers' saved seeds. This study intends to present an overview of the farmers' saved cereal seeds in Jhansi district of Uttar Pradesh, with particular reference to assessment of seed quality and storage methods.

MATERIALS AND METHODS

A survey was carried out in 51 rural households of nine villages, namely Baratha,

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Kochhabhnabar, Karnguwanji, Parichha, Karari, Padari, Jamaura, Jauhari and Chirgnaw located within a range of 30 km Jhansi district of Uttar Pradesh. The seeds of different agricultural crops stored for sowing purpose were randomly sampled using standard sampling procedures from farm households to estimate the seed quality parameters *viz.*, moisture content, physical purity, germination percentage and seed health status. A total of 81 samples from two crops were collected, comprising of 50 wheat and 31 maize seed samples. These samples represented the crop species cultivated in the routine cropping pattern of the farmers *i.e.* wheat and maize. During the survey, the interaction with the farmers was held along with a framed questionnaire and the data on the crop variety, storage methods, storage period and storage pest management practices adopted by farmers were recorded. The purity analysis was conducted and the different components such as pure seed and inert matter were determined as per ISTA Rules [8]. Further, seed quality parameters like moisture content, test weight, germination percentage, shoot length (cm), root length (cm), seedling dry weight (SDW) and vigour indices were also determined. The germination percentage was determined by using Between the Paper method. One hundred seeds in four replicates were kept for germination in rolled towel sheet and placed in the germination chamber at 20^{0}C (wheat) / 25^{0}C (maize). After eight (wheat)/ seven (maize) days of incubation, the seedlings were evaluated for normal, abnormal seedlings and fresh not germinated and dead seeds. However, the germination percentage was recorded based on the total number of normal seedlings only. The seedling length was estimated on linear scale, by randomly selecting ten normal seedlings from each replication of the standard germination test for root and shoot length measurement. For determination of the seedling dry weight, ten normal seedlings from each replicate of the germination test were selected at random and kept for oven drying, overnight at 90^{0}C temperature. The vigour indices were assessed based on germination percentage; seedling length and seedling dry weight [9].

Vigour index I = Germination % x Total seedling length (cm)

Vigour index II = Germination % x Seedling dry weight (mg)

It has been established that relative humidity and temperature are the most important factors affecting maintenance of seed quality during storage. Hence, temperature and relative humidity of these locations were recorded. The mean maximum and minimum temperature recorded for the 15 months storage period (January 2007 to March 2008) was 31.9° C and 15.6° C, respectively. The values of average relative humidity, RH I and RH II was calculated as 80.1 and 39.3 per cent, respectively.

RESULTS AND DISCUSSION

Seed storage practices

The survey results revealed that the type of storage method and container was decided on the basis of farmer's requirements, quantity of seed and storage period. The commonly used seed storage methods/containers included polythene lined urea bag, jute bag, room storage, bunnda, metal container, plastic container and mud pot (Table 1). The jute bag with a thin layer of polythene in the inner side was being used by 31.08% of farmers for storing high volume seeds, followed by polythene lined urea bags. However, farmers preferred jute bags wherein, the majority of the samples comprised of wheat and groundnut. In this survey, 25% of the total samples were stored in jute bags. The bags were fumigated for the control of storage pests during storage. 50% of the total seed samples of wheat and maize were kept in the room for storage. Initially, *bhusa* was spread on the floor to about 6 inches height from the floor. Thereafter, seed material was placed over the layer of bhusa, followed by covering with one

Table 1: Storage and seed management practices in farmers' saved cereal seed

Crop	Storage method	No. of samples	Seed treatment	No. of treated samples
Wheat	Jute bag	15	Celphos, Neem leaf, Bhusa	6
	Poly propylene gunny bag	11		8
	Room storage (Ojjen)	10		7
	Bunnda	10	Chemical	6
	Metal container	4	Chemical	3
	Total	50	-	30
Maize	Room Storage	4	-	Nil
	Jute bag	9	-	Nil
	Poly propylene bag	18	-	1
	Total	31	-	1

foot thickness of bhusa on the top. The dried neem leaves were used for every 2-3 feet layer of the seeds sandwiched between the layers of bhusa. Generally, about one quintal quantity of seed was stored in this manner.

The bunnda was made by a portion of the room, partitioned with cement or wooden planks and its size varied according to the farmer's requirements and quantity of seed. The bunnda was not covered from the top and storage method was same as practiced for the room storage. The containers were made of metal, plastic and mud pots. The insects that were found in the stored seeds at farmers' households mostly belonged to the coleopteran order. It was concluded through interaction with the farmers that they used both chemicals and organic materials (botanicals) for management of stored grain pests. The fumigant material (celphos) was being used to control the storage pest in the wheat seeds (6 out of 15 samples), especially for grain/ seed stored in open rooms. Farmers followed the practice of mixing the neem leaf along with the seeds or spread it over the top surface layer of the seeds. Also, it was found that wheat seeds were mixed with chickpea seeds. In case of high volume seeds like wheat, the dry chaff and chopped straw of cereal crops like oats, wheat and paddy were also mixed along with seeds.

Seed quality status

Wheat: 50 wheat samples recorded physical purity below the Indian minimum Seed Certification standards (IMSCS) i.e. 98 %; only two samples could meet the IMSCS requirements. The average seed test weight was 3.82 g, with a range between 3.04 - 4.66 g and 17 samples recorded test weight values more than 4.0 g. The mean moisture content was 10.5 per cent, which ranged between 8.6 – 12.3 percent (Table 2). Hence, it can be inferred that the farmers are aware of the seed drying methods, especially sun-drying to prevent the deterioration of grain/ seed during storage. A wide variation was observed in the germination percentage of wheat seed samples and ranged between 52 - 95 per cent. However, only 28 samples (56% of the total samples) could meet the IMSCS requirements for germination percentage (85%). The mean total seedling length was 21.6 cm, whereas the mean Vigour index I was 1949, ranging between 1149 – 2369. The mean seedling dry weight and Vigour index II values were 0.27g and 22.59, respectively

Table 2: Physical purity, test weight and moisture content of farmers' saved seeds of wheat

Sample	Pure seed(%)	Inert matter (%)	100 seed wt (gm)	Moisture content (%)	Insect infestation (%)	Embryo damage (%)
1	93.48	6.52	3.65	9.0	6.3	3
2	94.98	5.02	3.63	10.2	5.0	2
3	95.39	4.61	3.45	9.2	5.0	1
4	96.09	3.91	3.87	8.9	16.7	4
5	94.77	5.23	4.30	9.8	1.7	0
6	94.19	5.81	3.92	10.8	7.3	2
7	95.46	4.54	4.05	11.0	13	6
8	94.95	5.05	4.04	10.6	10	3
9	94.91	5.09	3.91	10.1	1.0	0
10	95.51	4.49	4.38	10.4	20	6
11	95.22	4.78	3.61	10.5	10	3
12	94.47	5.53	3.68	10.6	12.3	4
13	94.95	5.05	3.78	10.6	1.0	0
14	95.37	4.63	4.05	11.4	5.0	1
15	94.23	5.77	4.04	10.2	1.3	0
16	94.48	5.02	3.66	11.3	2.7	0
17	96.82	3.18	4.05	9.8	4.0	1
18	97.68	2.32	4.31	9.8	3.0	0
19	96.76	3.24	3.71	10.5	3.0	0
20	95.67	4.33	3.89	8.6	3.0	1
21	96.12	3.88	3.52	9.9	9.3	3
22	96.95	3.05	3.33	9.4	1.7	0
23	97.48	2.52	3.34	10.5	9. 1	2
24	96.59	3.41	4.06	11.1	2.0	0
25	95.52	4.48	4.14	10.9	3.7	0
26	95.96	4.04	4.65	10.6	6.0	1
27	95.71	4.29	4.66	10.6	1.7	0
28	94.7	5.3	3.34	10.6	1.7	0
29	97.16	2.84	3.55	1 1.2	3.3	1
30	97.95	2.55	3.13	10.5	3.3	1
31	96.04	3.96	3.54	9.8	4.3	1
32	95.25	4.75	3.82	11.4	4.0	1
33	95.91	4.09	3.26	10.8	2.3	0
34	96.77	4.23	3.57	8.9	2.7	0
35	98.98	1.52	3.95	10.8	3.0	0
36	97.79	2.21	3.43	10.6	5.0	1
37	99.03	0.97	4.32	10.6	3.7	1
38	95.95	4.05	3.04	11.2	2.7	0
39	95.89	4.11	4.11	10.6	3.3	1
40	95.6	4.4	4.20	9.3	4.3	1
41	95.82	4.18	3.93	11.6	2.3	0
42	95.3	4.7	4.33	11.4	2.3	0
43	96.07	4.93	3.61	12.1	1.7	0
44	95.82	4.18	3.90	11.6	5.3	2
45	96.76	3.24	3.82	11.9	4.3	1
46	95.72	4.28	4.12	9.8	3.3	1
47	91.27	8.73	3.93	10.6	5.3	1
48	96.57	3.43	3.48	11.0	7.3	2
49	96.69	3.31	3.52	12.3	6.0	2
50	96.07	3.93	3.34	11.1	2.0	0
Mean	95.86	4.19	3.82	10.5	4.7	1.2

(Table 3). However, the insect infestation was quite high, ranging from 1-20 per cent, while embryo damage was recorded upto 6 per cent. A seed lot under certification shall not have apparent or visible evidence of damage by insects for both Foundation and Certified seed classes in excess of 1.0 per cent for the seeds of maize and legumes and 0.50% for the seeds other than maize and legumes unless otherwise prescribed [3]. Hence, the seed quality was not as per the prescribed standards for insect damage.

Maize: The perusal of data pertaining to seed quality of maize revealed that only three out of 31 samples recorded physical purity above the IMSCS (98%), while the inert matter was more than 2 per cent in all the samples, which is above the maximum permissible limits. The moisture content of the samples was within the safe moisture level (12%) in seeds stored in jute bag and room storage. The mean moisture content, irrespective of container was 9.8 per cent. The insect infestation ranged between 1 to 9 per cent, while the embryo damage was recorded upto 3 per cent (Table 4). A seed lot under certification shall not have apparent or visible evidence of damage by insects for both Foundation and Certified seed classes in excess of 1.0 per cent for the seeds of maize and legumes and 0.50% [3]. Hence, the seed quality was quite poor in terms of insect damage. The average seedling shoot and root length was 14.5 and 15.9 cm, respectively and the mean vigour of 2749 was recorded. The average seedling dry weight of 1.03 mg and vigour index II of 5.13 was recorded. The analysis of the germination data of the maize seed samples revealed that there was a wide variation in among the seeds collected from different farmers. Only sixteen of the thirty one samples recorded germination capacity above the IMSCS (90%). Among these samples, the lowest and highest germination values observed were 82 and 99 per cent, respectively (Table 5).

The results of the survey showed that about 80% farmers of this region practice the saving of their own harvested produce. The same kind of practice is being followed in Kolli hills, south India which is known for inter and intraspecific minor millet diversity, where the farmers store one-tenth of the harvested quantity as seed material [10]. About 7.4 % of farmers purchased seeds from the cooperative society. About 52.4 percent of the farmers of this region were found to have used the polythene lined urea bags; followed by jute bags (18.6 %), room storage and bunnda method (4.8%) of storage [11].

Though the use of organic methods of seed management is safe, the use of chemical fumigants like celphos by the farmers seems inevitable for protection of high volume seeds like wheat, maize and paddy. The farmers of Senegal used dried and crushed neem leaves mix them with peanuts in the ratio of 1:4. Although insecticidal properties are more concentrated in the seeds, leaves were used because seeds are more difficult to process. A survey conducted in Central Ghana reported that approximately a quarter of the farmers used plant protectants in some form [12]. *Azadirachta indica* (neem) is one of the most common grain storage protectants of plant origin, besides *Chromoleana odorata* (Siam weed) and *Capsicum annum* (chilli pepper).

The ultimate effect of storing seeds over the layer of bhusa is that the bhusa absorbs excess moisture from the seeds or act as moisture absorbent by preventing the moisture dampness from the ground being absorbed by the seeds. Bhusa absorb the excess humidity due to fluctuating atmosphere, thereby maintaining the safe moisture level of seeds and their quality during storage. In the present survey, the farmers spread bhusa on the floor as layer above which wheat seed was stored. Similar practices were recorded by other workers [13, 14], who reported mixing of bhusa by farmers in Haryana and Karnataka. Ash powder serves as moisture absorbent and helps in

Table 3: Germination and vigour indices of farmers' saved wheat seed

Samples	Germination (%)	Shoot length (cm)	Root length (cm)	Total Seedling length(cm)	Vigour index I	Seedling dry weight(mg)	Vigour index II
1	92 (73.57)	10.5	12.1	22.6	2079	0.298	26.22
2	87 (69.04)	10.4	11.9	22.3	1940	0.285	24.85
3	84 (66.77)	12.6	12.6	25.2	2107	0.254	20.85
4	52 (46.15)	10.9	11.0	21.9	1149	0.273	14.35
5	88 (69.86)	11.9	10.9	22.8	1991	0.270	23.79
6	87 (61.11)	11.6	12.9	24.5	2123	0.254	21.48
7	78 (62.35)	11.5	11.2	22.7	1765	0.273	21.12
8	83 (66.16)	10.2	12.0	22.2	1840	0.306	25.40
9	79 (62.75)	11.0	12.1	23.1	1820	0.256	20.17
10	80 (63.89)	10.8	12.1	22.9	1818	0.251	20.10
11	88 (70.34)	11.2	12.0	23.2	2036	0.260	22.82
12	81 (64.58)	10.0	11.5	21.5	1702	0.283	20.89
13	95 (74.79)	11.4	11.1	22.5	2138	0.256	24.16
14	87 (71.71)	12.4	13.0	25.4	2219	0.256	22.10
15	95 (77.24)	12.6	12.4	25.0	2369	0.259	24.5
16	86 (68.10)	11.6	12.4	24.0	2061	0.251	21.56
17	71 (57.61)	11.7	12.3	24.0	1698	0.262	18.38
18	84 (66.50)	11.7	13.1	24.8	2079	0.275	25.10
19	85 (67.46)	11.9	12.6	24.5	2120	0.307	26.03
20	86 (68.10)	11.8	12.5	24.3	2035	0.282	29.25
21	68 (55.55)	9.4	7.5	16.9	1249	0.211	14.35
22	89 (70.82)	10.8	11.3	22.1	1961	0.257	22.99
23	82 (65.24)	12.3	10.7	23.0	1880	0.251	20.37
24	89 (72.82)	10.9	11.3	22.2	1975	0.264	18.02
25	89 (72.40)	11.6	12.2	23.8	2113	0.263	23.33
26	90 (72.44)	11.5	11.9	23.4	2094	0.290	24.38
27	93 (74.79)	11.6	12.2	23.8	2221	0.288	26.73
28	86 (68.10)	11.3	12.3	23.6	2096	0.263	22.58
29	73 (60.20)	11.7	12.5	24.2	1889	0.248	18.10
30	68 (55.62)	11.5	12.5	24.0	1676	0.306	20.85
31	90 (74.19)	10.6	12.0	22.6	2036	0.306	27.58
32	75 (61.40)	12.4	14.6	27.0	2023	0.348	26.98
33	86 (68.73)	12.6	13.8	26.4	2265	0.277	25.94
34	92 (74.23)	12.6	12.4	25.0	2292	0.308	28.16
35	86 (68.29)	10.4	11.4	21.8	1873	0.234	20.12
36	82 (65.10)	10.1	11.5	21.6	1770	0.214	17.53
37	84 (66.50)	11.0	11.7	22.7	1880	0.244	20.43
38	90 (72.05)	11.8	12.3	24.1	2170	0.289	26.13
39	83 (65.89)	10.8	12.6	23.4	1948	0.262	21.70
40	78 (62.14)	9.8	0.6	10.4	1670	0.266	20.73
41	92 (73.83)	10.2	0.4	10.6	1983	0.277	26.33
42	80 (63.72)	10.8	0.8	11.6	1813	0.276	22.10
43	88 (70.00)	11.3	0.7	12.0	2016	0.259	22.65
44	89 (71.30)	11.2	0.6	11.8	2031	0.257	22.90
45	86 (68.10)	10.4	0.2	10.6	1861	0.263	22.67
46	87 (69.51)	10.9	1.5	12.4	1953	0.284	24.81
47	94 (76.02)	11.8	13.1	24.9	2337	0.348	32.63
48	84 (66.59)	10.9	11.4	22.3	1877	0.253	21.21
49	79 (62.97)	10.2	10.7	20.9	1667	0.230	17.36
50	82 (66.12)	9.7	11.2	20.9	1745	0.229	16.76
Mean	83.1 (66.71)	11.2	12.2	21.6	1949	0.269	22.59
SED	2.58	0.45	2.17		87	0.016	1.67
CD (p = 0.05)	7.21	1.25	6.10		243	0.046	4.66

Table 4. Physical purity, test weight and moisture content of farmer saved seeds of maize.

Samples	Pure seed (%)	Inert matter (%)	100 seed wt (g)	Moisture content (%)	Insect infestation (%)	Embryo damage (%)
1	95.69	4.31	14.2	9.8	3	0
2	93.4	6.6	14.9	9.2	5	1
3	94.59	5.41	11.5	10.4	6	1
4	96.79	3.21	16.0	9.1	4	1
5	97.8	2.2	13.4	10.3	7	2
6	94.2	5.8	11.2	10.2	7	2
7	97.42	2.58	13.4	11.0	5	2
8	98.5	1.5	11.8	10.2	4	1
9	95.92	4.08	14.6	9.6	4	1
10	97.64	2.36	13.2	8.3	2	0
11	97.02	2.98	16.1	10.4	1	0
12	96.77	3.23	16.5	10.0	2	0
13	94.78	5.22	12.6	10.3	4	1
14	95.1	4.9	13.1	9.7	7	2
15	93.94	6.06	15.6	9.9	6	2
16	96.01	3.99	14.4	8.8	6	1
17	97.23	2.77	12.5	8.9	4	0
18	98.4	1.6	11.2	10.1	5	1
19	98.08	1.92	12.5	8.5	5	1
20	96.63	3.37	16.4	12.4	9	3
21	95.84	4.16	13.0	9.7	3	1
22	94.88	5.12	17.5	9.9	4	1
23	94.45	5.55	14.2	9.7	3	0
24	93.92	6.08	12.2	9.7	3	1
25	92.03	4.97	16.6	10.1	4	1
26	95.82	4.18	13.5	9.7	7	2
27	96.6	3.4	12.0	10.4	6	2
28	96.29	3.71	14.0	9.7	5	1
29	96.44	3.56	12.7	10.4	4	1
30	96.1	3.9	13.5	10.3	4	1
31	96.22	3.78	13.6	9.9	4	1
Mean	95.95	3.95	13.8	9.8	4.6	1.1

Table 5. Germination and vigour indices of farmers saved maize seed

Samples	Germination (%)	Shoot length (cm)	Root length (cm)	Seedling length (cm)	Vigour index I	Seedling dry weight(mg)	Vigour index II
1	88 (70.00)	11.0	17.5	28.5	2805	1.39	122.50
2	87 (69.12)	12.2	16.2	28.4	2501	1.26	109.71
3	98 (84.23)	14.6	16.7	31.3	3078	1.07	104.74
4	94 (654.12)	14.9	16.1	31.0	2910	0.79	74.65
5	88 (70.10)	14.4	16.6	31.0	2706	1.01	89.14
6	99 (87.12)	14.1	14.8	28.9	2854	1.05	103.90
7	88 (70.00)	11.8	14.0	25.8	2266	0.84	76.65
8	90 (72.10)	16.1	16.6	32.7	2938	0.89	112.68
9	95 (77.36)	15.4	17.4	32.8	3107	1.25	123.05
10	92 (73.83)	17.2	16.7	33.9	3110	0.95	87.51
11	95 (78.90)	16.7	16.7	33.4	3164	0.85	80.60
12	82 (65.10)	14.3	16.7	31.0	2540	0.89	72.91
13	87 (68.90)	13.2	13.6	26.8	2320	1.34	116.36
14	95 (78.90)	17.4	15.7	33.1	3177	1.47	139.65
15	99 (87.11)	15.3	16.0	31.3	3101	0.81	79.86
16	82 (65.10)	16.2	14.6	30.8	2536	0.98	66.06
17	86 (66.59)	16.2	16.7	32.9	2819	1.03	88.27
18	94 (77.83)	16.2	16.2	32.4	3027	0.94	88.39
19	92 (73.83)	13.9	16.0	29.9	2763	1.12	103.49
20	87 (68.16)	13.5	15.0	28.5	2476	0.82	71.10
21	91 (73.00)	14.0	16.2	30.2	2831	1.21	110.32
22	84 (66.50)	13.2	15.1	28.3	2378	0.85	71.53
23	84 (66.50)	13.4	15.1	28.5	2398	0.93	78.31
24	90 (72.05)	15.6	17.2	32.8	2989	1.13	101.98
25	93 (76.72)	15.3	17.0	32.3	3027	0.89	83.19
26	84 (66.50)	12.8	14.3	27.1	2273	1.06	88.61
27	91 (73.01)	15.0	16.2	31.2	2858	0.85	77.17
28	86 (68.43)	13.8	15.6	29.4	2570	0.90	79.05
29	91 (72.61)	14.8	16.4	31.2	2772	0.89	81.12
30	86 (68.10)	13.9	15.1	29.0	2520	1.08	92.73
31	86 (68.29)	13.2	14.8	28.0	2410	1.24	106.56
Mean	92.7(72.32)	14.5	15.9	30.4	2749	1.03	92.96
SEd	3.805	0.55	0.51		107.73	0.05	5.13
CD (p= 0.05)	10.69	1.53	1.43		302.65	0.14	14.41

removal of excess moisture. Mixing of ash and kerosene with seeds of pulse crops form a coating on the seed and discourage the oviposition by bruchids *(Callosobruchus chinensis)* on the otherwise rough surface of the untreated seed coat. The Konda Reddy women from Andhra Pradesh state mix domestic ash to the seeds and preserve them in earthen pots. The seeds are touched only before sowing time to avoid contamination [8]. The Navdanya Research Foundation for Science, Technology and Ecology suggested that for 500 grams of fresh dry wood ash that has cooled should be added for every kilogram of seed. Thereafter, the seeds are pot in the container for storage.

The parameters of physical purity included pure seed and inert matter only; other components like wheat seeds and other crop seeds were not found. This can be attributed to the fact that the farmers are not growing mixed / inter crops and maturity period were also different. Hence, the chances of mechanical admixtures were quite less. The wheat sample having the lowest germination of 52 percent was attributed to the maximum insect attack of 16.7 per cent. The moisture content of the seeds of all wheat samples, except two was observed to be below the 12 percent because most of the samples were stored in moisture pervious container. Around 30 percent of the samples were treated with fumigants (celphos). Neem leaf was found to have been used for the seeds of wheat. The other methods to prevent seed deterioration used were mixing of bhusa in

wheat with seeds. Though the scientific storage and management methods are having their merits and are being advocated, the traditional low cost seed storage methods and management practices needs to be equally promoted after proper scientific validation as these methods would be helpful to the resource poor farmers having limited access to modern methods.

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