Original Research Article

Survey to assess the quality of groundnut seeds used by the farmers of Tiruvannamalai district of Tamil Nadu

ABSTRACT

A drill-box survey was carried out during the Kharif 2020 season at the time of sowing in four villages, including three villages in Thurinjapuram block and one village in Thandrampattu block of Tiruvannamalai district, with the objective of determining the seed quality of groundnut used for sowing by farmers. Out of the 90 samples that were collected, the study found that 31 samples (or 34.44 percent) were TMV-7, 58 samples (or 64.44 percent) were TMV-13, and one sample was VRI-2. This indicates that TMV 13 is the primary variety being grown (Red kernal type). The Hollow-Heart symptoms are a sign that the boron content of the soil is low, which is meant to reduce germination. The symptoms of a hollow heart might be anywhere between 0% and 20%. The prevalence of hollow-heart symptoms, which ranges from 0% to 20%, was highest in two villages, Randam and Thenkarambalur. Dark-plumule seeds are a sign of a calcium deficit in the soil, which is intended to reduce germination. Out of 90 samples, this symptom was reported by nearly all of the villagers, ranging from 0 to 20%. The importance of germination percentage in determining seed quality Only 53 samples (58.90%) of the 90 total samples were found to exceed the minimum seed certification standard of 70% or above. The percentage of diseased seeds in seed samples ranges from 3-22.5 percent; the village of Vallivagai in Thurinjapuram Block has the highest infection rate. The findings imply that the quality of groundnut seed sown by farmers in Tamil Nadu's Tiruvannamalai area was excellent. However, farmers must be better knowledgeable about the importance and advantages of using high-quality certified seeds and must receive training in maintaining seed quality by using pre- and post-harvest methods in order to harvest high yields of the desired varieties.

Keywords: Farmers saved, groundnut, seed quality, hollow – heart, germination percentage, vigour index.

1. INTRODUCTION

Commonly referred to as "poor man's nuts," groundnuts (*Arachis hypogaea* L.) are a significant food crop that are extensively utilised as vegetable protein and edible oil. It is the sixth-most significant oilseed crop worldwide. With a global production of 37.1 million MT and 26.4 Mha under cultivation [1]. It has a typical yield of 1520 kg/ha and is adapted to tropical, subtropical, and warm temperate climates [2]. In areas where rainfall ranged from 500 to 1250 mm, groundnut crops could be grown [3]. It cannot resist prolonged dryness, stagnant water, or freezing. Gujarat, Andhra Pradesh, Karnataka, Tamil Nadu, and Maharashtra are the states with the largest groundnut production. Eighty-six percent of India's groundnut production is contributed by these five states [4]. Tamil Nadu has an area of 338300 hectares and produces 783200 tonnes [5]. Vellore, Cuddalore, Thiruvannamalai,

Dharmapuri, Salem, Erode, Theni, Trichy, Madurai, Perambalur, Ariyalur, Pudukkottai, and Kancheepuram district are the major groundnut-producing districts [6].

Groundnut seeds can be maintained for numerous generations since they are a self-pollinating crop, maintaining their genetic purity. In reality, however, mingling with other types in farmer's fields as well as in the threshing and processing yards causes gradual deterioration of original stock. Farmers of Thiruvannamalai district generally use their own saved seeds for sowing of groundnut which is harvested from the previous season and are stored in gunny bags under ambient condition, a traditional method of storage in the region. The groundnut seeds are stored in the form of pods as well as kernels.

The formal seed sector in India contributes only about 30-35 percent of total seed requirements, whereas the informal seed sector contributes enormously, primarily in the form of farmers' own seed, also known as Farm Saved Seed (FSS) which accounts for 65-70 percent of total seed requirements [7], indicating low seed replacement rates (SRRs). Although India's seed industry is the fifth largest in the world, with strong expansion, only 24% of sub-marginal and 29% of marginal farmers replace seeds every year, compared to 40% of large farmers. The informal seed sector, which accounts for 65-70 percent of total seed production, is dominated by farm-saved seeds (FSS). The percentage of small and marginal farmers who have access to high-quality seed is only 20% [8]. Indian farmers are still in use of farmer-saved seeds as input. Despite yield loss recurring from farm saved seeds, Indian farmers resist switching over to hybrid seeds and other high yielding varieties [9]. In order to create awareness among the farmers about the role of quality seeds in improving the farm productivity and income, through various extension functionaries, the government of India conducts training programmers to the farmers. In line with the department of agriculture, state agricultural universities are also conducting field demonstration and kissan mela to make the farmers aware of improving the quality of farm saved seeds [10]. Against the stalemate, a study was conducted to determine the seed quality of groundnut used by the farmers of Tiruvannamalai district of Tamil Nadu.

2. MATERIAL AND METHODS

Farmer saved groundnut seed samples were collected from Vanapuram, Varagur, Thenkarambalur, Agarampallipattu, Nedungavadi villages in Thandrampattu Block of Tiruvannamalai District, Tamil Nadu, India during Rabi, 2020-21. Ten samples in each village were collected and the following seed quality parameter viz.,100 kernel weight, hollo-heart, darkened plumule, germination, dry weight of seedling, vigour index and seeds infected with disease were evaluated.

100 kernel weight (g)

100 kernal weight was calculated using 100 kernals with eight replications with a highly precise electronic balance [11] (WENSAR – HPB200).

Seeds with dark plumule (%)

Number of seeds with dark plumule was calculated and expressed as percentage.

Physiological quality of groundnut seeds

The groundnut seeds were tested for different physiological seed quality parameters such as germination percentage, dry matter production and vigour index as per ISTA seed testing protocols [12]. The Vigour index was also calculated [13].

VI=Percent germination X Total seedling length (cm)

Seeds infected with disease(%)

Seeds infected with disease was calculated and expressed as percentage

Statistical analysis

The results were subjected to analysis of variance and assessed (t-test) for significant differences (p=0.05) [14]. Prior to statistical analysis, percentage values were converted to arc sine values and correlation was performed using SPSS software.

3. RESULTS AND DISCUSSION

Randam Village in Thurinjapuram Block

In Randam village 10 samples were collected and seed quality parameters were evaluated. Out of 10 samples, six samples were TMV 7 and four samples were TMV 13 variety.The 100 kernel weight varies from 31.0 g to 34.2 g. Hollow- heart percentage varies from two to 20 per cent.The seeds with dark plumule percentage varies from two to 18 per cent.The germination percentage of collected sample varies from 65 to 85 per cent. Out of 10 samples, five samples were recorded below the 70 per cent germination. The vigour index of the seed sample varies from 191 to 271.The percentage of seeds infected with disease varies from 7.5 to 20 per cent (Table 1).

Table 1. Seed quality characteristics of groundnut farm saved seeds in Randam village in Thurinjapuram block, Tiruvannamalai District during Kharif, 2020.

Sample No.	Variety	100 kernel Weight (g)	Hollow heart (%)	Seeds with dark plumule (%)	Germination (%)	Seedling dry weight (g/10 seedlings)	Vigour Index	Seeds infected with disease (%)
1	TMV 7	34.2	20	16	74	3.09	229	12.5
2	TMV 13	32.2	12	8	69	3.07	212	12.5
3	TMV 7	33.2	10	18	65	2.85	185	20.0
4	TMV 7	31.9	10	10	75	2.99	225	7.5
5	TMV 13	31.8	11	8	67	3.00	201	15.0
6	TMV 7	32.0	12	16	66	2.89	191	20.0
7	TMV 13	31.0	10	6	67	2.85	191	17.5
8	TMV 7	31.6	2	2	79	3.00	237	7.5
9	TMV 13	31.2	12	4	85	3.19	271	7.5
10	TMV 7	32.1	4	2	81	3.09	250	7.5

Vallivagai Village in Thurinjapuram Block

In Vallivagai village 10 samples were collected and seed quality parameters were evaluated. Out of 10 samples, seven samples were TMV 13 and three samples were TMV 7 variety.The 100 kernel weights varies from 30.6 g to 36.2 g. Hollow- heart percentage varies from zero to 10 per cent. The seeds with dark plumule percentage varies from two to eight per cent.The germination percentage of collected sample varies from 63 to 76 per cent. Out of 10 samples, six samples were recorded below the 70 per cent germination. The vigour index of the seed sample varies from 191 to 244.The percentage of seeds infected with disease varies from 10 to 22.5 per cent (Table 2).

Table 2. Seed quality characteristics of groundnut farm saved seeds in Vallivagai village in Thuringapuram Block, Tiruvannamalai District during Kharif, 2020.

Sample No.	Variety	100 kernel Weight (g)	Hollow heart (%)	Seeds with dark plumule (%)	Germination (%)	Seedling dry weight (g/10 seedlings)	Vigour Index	Seeds infected with disease (%)
1	TMV 13	35.0	4.0	2.0	74	2.89	213	12.5
2	TMV	30.6	2.0	8.0	66	2.89	191	10.0

	13							
3	TMV 13	31.6	0.0	6.0	63	3.10	195	17.5
4	TMV 13	33.9	0.0	8.0	73	3.22	235	12.5
5	TMV 13	31.4	0.0	6.0	74	3.55	226	12.5
6	TMV 7	33.9	0.0	6.0	76	3.22	244	10.0
7	TMV 7	33.5	10.0	6.0	67	3.09	207	22.5
8	TMV 13	32.4	6.0	10.0	68	2.90	197	17.5
9	TMV 13	36.2	2.0	6.0	69	2.89	199	12.5
10	TMV 7	34.1	10.0	2.0	68	2.92	199	15.0

Mangalam Village in Thurinjapuram Block

In Mangalam village 10 samples were collected and seed quality parameters were evaluated. Out of 10 samples, three samples were TMV 7 and seven samples were TMV 13 variety.The 100 kernel weight varies from 31.0 g to 33.6 g.The seeds with hollow- heart percentage varies from zero to six per cent.The presence of dark plumule percentage varies from two to 10 per cent.The germination percentage of collected sample varies from 73 to 87 per cent. All the samples recorded above 70 per cent germination. The vigour index of the seed sample varies from 219 to 280.The percentage of seeds infected with disease varies from five to 12.5 per cent (Table 3).

Table 3. Seed quality characteristics of groundnut farm saved seeds in Mangalam village in Thuringapuram Block, Tiruvannamalai District during Kharif,2020

Sample No.	Variety	100 kernel Weight (g)	Hollow heart (%)	Seeds with dark plumule (%)	Germination (%)	Seedling dry weight (g/10 seedlings)	Vigour Index	Seeds infected with disease (%)
1	TMV 13	32.1	2.0	4.0	73	3.00	219	7.5
2	TMV 7	32.3	0.0	10.0	77	3.10	239	12.5
3	TMV 13	31.0	4.0	6.0	79	3.04	240	10.0
4	TMV 13	31.9	6.0	2.0	80	3.18	255	5.0
5	TMV 13	33.4	6.0	8.0	81	3.19	258	5.0
6	TMV 13	32.4	2.0	6.0	85	3.20	271	7.5
7	TMV 7	33.0	2.0	6.0	82	3.10	254	10.0
8	TMV 13	32.1	6.0	6.0	80	3.04	243	7.5
9	TMV 7	33.6	0.0	6.0	87	3.22	280	10.0
10	TMV 13	33.0	6.0	8.0	79	3.14	248	7.5

Thenkarumbalur Village in Thandrampattu Block

In Thenkarumbalur village 10 samples were collected and seed quality parameters were evaluated. Out of 10 samples, six samples were TMV 7 and four samples were TMV 13

variety.The 100 kernel weight varies from 33.4 g to 36.0 g. Hollow- heart percentage varies from zero to 20 per cent.The seeds with dark plumule percentage varies from two to 20 per cent. The germination percentage of collected sample varies from 62 to 87 per cent. Out of 10 samples, four samples were recorded below the 70 per cent germination. The vigour index of the seed sample varies from 156 to 278. The percentage of seeds infected with disease varies from 7.5 to 20 per cent (Table 4).

Table 4. Seed quality characteristics of groundnut farm saved seeds in Thenkarumbalur village in Thandrampattu Block, Tiruvannamalai District during Kharif,2020

Sample No.	Variety	100 kernel Weight (g)	Hollow heart (%)	Seeds with dark plumule (%)	Germination (%)	Seedling dry weight (g/10 seedlings)	Vigour Index	Seeds infected with disease (%)
1	TMV 7	36.0	6	4.5	87	3.19	278	15.0
2	TMV 7	35.6	0	6.0	85	3.15	268	7.5
3	TMV 7	35.4	6	2.0	77	3.20	247	12.5
4	TMV 13	34.7	4	22.0	61	2.56	156	7.5
5	TMV 13	35.3	8	14.0	67	2.91	195	20.0
6	TMV 13	33.4	2	18.0	70	2.93	205	7.5
7	TMV 13	34.6	20	16.0	62	2.51	156	17.5
8	TMV 7	36.8	10	6.0	72	3.33	240	12.5
9	TMV 7	34.8	10	20.0	65	2.68	175	15.0
10	TMV 7	34.2	8	6.0	70	3.05	214	7.5

During Rabi, 2020-21, farmer saved groundnut seed samples were collected from Vanapuram, Varagur, Thenkarambalur, Agarampallipattu, Nedungavadi villages in Thandrampattu Block of Tiruvannamalai District. Ten samples in each village were collected and the following seed quality parameter viz.,100 kernel weight, Hollo-heart, Darkened plumule, germination, dry weight of seedling, vigour index and seeds infected with disease were evaluated and presented in the Table 5-9.

Table 5. Seed quality characteristics of groundnut farm saved seeds in Vaanapuram village in Thandrampattu Block, Tiruvannamalai District during Rabi, 2020-21.

Sample No.	Variety	100 kernel Weight (g)	Hollow heart (%)	Seeds with dark plumule (%)	Germination (%)	Seedling dry weight (g/10 seedlings)	Vigour Index	Seeds infected with Disease (%)
1	TMV 13	41.3	0.0	1.0	72	3.03	218	7.0
2	TMV 13	42.3	2.0	3.0	68	2.78	189	5.0
3	TMV 13	36.1	2.0	2.0	74	3.01	223	7.0
4	TMV 13	37.7	0.0	0.0	80	3.26	261	6.0

5	TMV 13	39.9	1.0	1.0	82	3.18	261	8.0
6	TMV 13	32.0	1.0	2.0	68	2.98	203	7.0
7	TMV 13	32.5	0.0	0.0	74	3.31	245	3.0
8	TMV 13	38.6	2.0	3.0	76	3.42	260	7.0
9	TMV 13	36.2	2.0	0.0	82	3.08	253	6.0
10	VRI 2	42.6	0.0	1.0	78	3.38	263	9.0

Table 6. Seed quality characteristics of groundnut farm saved seeds in Varagur village in Thandrampattu Block, Tiruvannamalai District during Rabi,2020-21

Sample No.	Variety	100 kernel Weight (g)	Hollow heart (%)	Seeds with dark plumule (%)	Germination (%)	Seedling dry weight (g/10 seedlings)	Vigour Index	Seeds infected with disease (%)
1	TMV 13	40.1	0.0	0.0	68	2.99	203	7.0
2	TMV 13	32.9	1.0	3.0	76	2.93	223	9.0
3	TMV 13	33.3	4.0	4.0	72	2.12	225	10.0
4	TMV 13	39.9	7.0	9.0	66	3.33	220	11.0
5	TMV 13	37.6	2.0	3.0	78	3.21	250	9.0
6	TMV 13	39.3	2.0	5.0	76	3.13	238	7.0
7	TMV 13	32	4.0	11.0	58	2.78	161	13.0
8	TMV 13	38.6	2.0	7.0	78	2.98	232	7.0
9	TMV 13	36.1	5.0	13.0	66	2.93	193	15.0
10	TMV 13	32.5	4.0	5.0	72	3.02	217	9.0

Table.7 Seed quality characteristics of groundnut farm saved seeds in Thenkarumbalur village in Thandrampattu Block, Tiruvannamalai District during Rabi ,2020-21

Sample No.	Variety	100 kernel Weight (g)	Hollow heart (%)	Seeds with dark plumule (%)	Germination (%)	Seedling dry weight (g/10 seedlings)	Vigour Index	Seeds infected with disease (%)
1	TMV 7	38.4	0.0	0.0	72	3.12	225	7.0
2	TMV 7	39.7	1.0	3.0	74	3.24	240	11.0
3	TMV 13	36.6	2.0	3.0	68	3.16	215	15.0
4	TMV 13	34.6	0.0	0.0	76	2.89	220	7.0
5	TMV 13	36.1	3.0	5.0	64	3.10	198	15.0

6	TMV 13	38.8	1.0	7.0	68	2.86	195	13.0
7	TMV 13	38.1	2.0	4.0	70	3.22	225	7.0
8	TMV 13	36.6	2.0	1.0	78	3.31	258	8.0
9	TMV 13	33.3	5.0	9.0	68	3.24	220	13.0
10	TMV 13	32.5	7.0	15.0	58	2.93	170	17.0

Table.8 Seed quality characteristics of groundnut farm saved seeds in Agarampallipattu village in Thandrampattu Block, Tiruvannamalai District during Rabi, 2020-21

Sample No.	Variety	100 kernel Weight (g)	Hollow heart (%)	Seeds with dark plumule (%)	Germination (%)	Seedling dry weight (g/10 seedlings)	Vigour Index	Seeds infected with disease (%)
1	TMV 13	35.1	3.0	7.0	62	2.86	177	11.0
2	TMV 13	41.3	7.0	11.0	68	3.24	220	13.0
3	TMV 13	39.1	9.0	9.0	64	3.01	193	13.0
4	TMV 13	39.2	5.0	4.0	70	3.03	212	11.0
5	TMV 13	44.4	11.0	11.0	50	2.98	149	14.0
6	TMV 7	41.7	5.0	6.0	60	3.21	193	13.0
7	TMV 7	36.0	8.0	11.0	88	3.33	293	15.0
8	TMV 13	38.5	6.0	12.0	56	2.86	160	16.0
9	TMV 13	37.4	5.0	7.0	60	3.03	182	8.0
10	TMV 13	34.3	3.0	4.0	74	3.12	231	11.0

Table.9 Seed quality characteristics of groundnut farm saved seeds in Nedungavadi village in Thandrampattu Block, Tiruvannamalai District during Rabi, 2020-21

Sample No.	Variety	100 kernel Weight (g)	Hollow heart (%)	Seeds with dark plumule (%)	Germination (%)	Seedling dry weight (g/10 seedlings)	Vigour Index	Seeds infected with disease (%)
1	TMV 7	38.6	3.0	7.0	72	3.13	225	7.0
2	TMV 7	40.2	4.0	5.0	76	3.23	245	8.0
3	TMV 7	36.1	3.0	2.0	80	3.12	250	5.0
4	TMV 13	35.1	4.0	7.0	68	2.98	203	13.0
5	TMV 7	34.2	2.0	3.0	72	3.03	218	5.0
6	TMV 7	35.4	1.0	3.0	70	3.22	225	7.0
7	TMV 7	36.1	3.0	9.0	62	3.31	205	13.0

8	TMV 7	33.2	2.0	11.0	66	3.08	203	15.0
9	TMV 7	36.2	3.0	7.0	70	3.28	230	9.0
10	TMV 7	34.7	7.0	11.0	64	3.14	201	15.0

During Rabi 2020-21 out of 50 samples ,72 per cent samples were TMV 13,26 per cent samples were TMV 7 and remaining two per cent samples were VRI 2.With respect to germination,42 per cent of seed samples (21 out of 50 samples) recorded IMSC standard generation of 70% and above.The seeds with hallow- heart symptom varies from one to two per cent in Vaanapuram village, zero to seven per cent each in Varagur village and Thenkarambalur village, Three to 11 per cent in Agarampallipattu village and three to seven per cent in Nedungavadi village. The seeds with dark plumule symptom varies from one to two per cent in Vaanapuram village, zero to seven per cent each in Varagur village and Thenkarambalur village, Three to 11 per cent in Agarampallipattu village and three to seven per cent in Nedungavadi village.The seeds infected with disease varies from five to nine per cent in Vaanapuram village, seven to 15 per cent in Varagur village, seven to 17 per cent in Thenkarambalur village,11 to 16 per cent in Agarampallipattu and five to 15 per cent in Nedungavadi village. The present results are in close correspondence with findings of [15;16]. Farmer's saved groundnut seed samples studied were registered germination percentage up to desired level [17]. Prasad et al. (1994) reported that 81 per cent of groundnut seed samples met the minimum requirement of prescribed limit for germination [18]. 99 per cent seed samples of groundnut had germination above prescribed limit [19].

4. CONCLUSION

In Tiruvannamalai district of Tamil Nadu, majority of farmers use their own saved seeds for sowing of groundnut crop every year. The present study clearly showed that, Out of 90 samples collected, 31 samples were TMV 7 (34.44%), 58 samples were TMV 13 (64.44%) and one sample was VRI 2. This shows major variety under cultivation is TMV 13 (Red kernal type). 53 samples (58.90%) recorded above Minimum Seed Certification Standard of 70 percent of germination and above. Although, the seeds of groundnut used for sowing by farmers of Tiruvannamalaidistrict were better quality with respect to germination. But in order to harvest high yields of the desired varieties, farmers must be better informed about the value and benefits of utilizing high-quality, certified seeds and trained to maintain the seed quality by applying pre- and post-harvest practices.

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