ISSN Print: 2664-6064
ISSN Online: 2664-6072
NAAS Rating (2026): 4.69
IJAN 2026; 8(5): 64-67
www.agriculturejournal.net
Received: 16-01-2026
Accepted: 18-02-2026

Abhishek Biradar
Product Development Office, Chiatia India Pvt Ltd, Bangalore, Karnataka, India

Gnyandev B
Scientist, Seed Science and Technology, ICAR Krishi Vigyan Kendra Raddewadgi, UAS, Raichur, Karnataka, India

Umesh Hiremath
Assistant Professor, Seed Science & Technology, Seed Unit, UAS, Raichur, Karnataka, India

NM Shakuntala
Professor & Head, Department of Seed Science & Technology, UAS, Raichur, Karnataka, India

Mathad PF
Associate Professor, Department of PFE, College of Agricultural Engineering, UAS, Raichur, Karnataka, India

Corresponding Author:
Abhishek Biradar
Product Development Office, Chiatia India Pvt Ltd, Bangalore, Karnataka, India

A Study on Seed Storability Parameters Shoot Length, Root Length And Seed Drying Weight of Soybean As Influenced By Different Methods of Threshing and Processing

Abhishek Biradar, Gnyandev B, Umesh Hiremath, NM Shakuntala and Mathad PF

DOI: https://www.doi.org/10.33545/26646064.2026.v8.i5a.642

Abstract
An experiment was conducted to study The seed storability of soybean is influenced by different methods of threshing and processing was studied at the Department of Seed Science and Technology, College of Agriculture, Raichur under ambient conditions. The experiment was conducted in laboratory using Factorial Completely Randomized Design with three replications. The shoot length showed significant differences as influenced by different threshing methods, processing operations and their interaction effects at different months of storage period significantly lowest shoot length was recorded in T_3 (11.64 cm), P_1 (12.31 cm) and T_3P_1 (11.36 cm). Further the study shows that, the root length showed significant differences as influenced by different threshing methods, processing operations and their interaction effects at different months of storage period, the highest shoot length was recorded in T_1 (14.86 cm), P_3 (14.31 cm) and T_1P_3 (15.05 cm) The results of seedling dry weight as influenced by different threshing methods, processing operations and their interaction effects at different months of storage period Whereas, initially higher seedling dry weight was recorded in T_1 (614.93 mg) and P_3 (611.43 mg) and T_1P_3 (618.50 mg).

Keywords: Precision agriculture, Remote sensing, UAV, IoT, Variable rate technology, Smart farming, Indian agriculture, Food security, Digital agriculture

Introduction
Soybean [*Glycine max* (L.) Merrill] has gained significance throughout the world as an important oil seed crop and an annual legume because of its wide range of geographic adaptation, distinctive chemical composition, high nutritional value with functional health benefits and numerous applications in the food and related industries. It is a multipurpose legume rich in both protein and oil content with the ability to resolve food and nutritional security in developing countries hence considered as “Golden bean”. Soybean ranks first in the international market among the world’s major oil seed crops (FAO, 2020). It accounts for 42 per cent of overall oilseed production, 22 per cent of total oil production and 2/3rd of the global protein concentrates for livestock feeding. Soybean was also named as “wonder crop” or “Miracle crop” as its seed contains diverse nutritional characteristics such as 20 per cent oil with 85 per cent unsaturated fatty acids including 55 per cent poly unsaturated fatty acids (PUFA), 40 per cent good quality protein, antioxidants, 4-5 per centminerals and 25-30 per cent carbohydrates. It is mostly grown in kharif season on black cotton soils and gathered seed is stored till the next year for sowing, which is a challenging operation due to its poor storability. Therefore, the significant barrier to the soybean production each year is the non-availability of high quality seed for farmers. Due to the fact that soybean seed is a poor storer and is more susceptible to mechanical damage from harvest to the following sowing season, maintaining seed quality after harvest and during storage is a major challenge. The post-harvest processing of soybean seed includes threshing, drying, grading, transportation, various handling processes, and storage. Because of its very thin seed coat and low lignin

content, soybean seed is regarded as a poor store because it loses its viability and vigour at a faster rate as a result of loss of seed membrane permeability. Mechanical damage is the main cause of this loss of soybean seed quality because the seed's thin seed coat offers little protection to the delicate radical, which is located in a vulnerable position directly beneath the seed coat (Alvarez *et al*. 1997) [1]

Material and Methods

The seeds obtained by use of different threshing methods *viz*., T_1, Multi-crop thresher with 300 rpm; T_2, Multi-crop thresher with 500 rpm and T_3, Threshing by combine harvester and same seeds as per assigned treatments subjected to processing operations *viz*., P_1, Air screen cleaner; P_2, Air screen cleaner followed by gravity separator; and P_3, Air screen cleaner followed by gravity separator and spiral separator were stored in small gunny bags and placed in the seed storage cabinet at the Department of Seed Science and Technology, College of Agriculture, Raichur under ambient conditions. These seeds were used for further testing of seed quality parameters. The experiment was conducted in laboratory using Factorial Completely Randomized Design with three replications.

The seeds were used for recording parameters *viz*., 100 seed weight, bulk density, seed germination, shoot length, root length, seedling dry weight, seedling vigour index –I, seedling vigour index – II, electrical conductivity, dehydrogenase enzyme activity and peroxidase activity. All of the above parameters were recorded for every month, with the exception of peroxidase and dehydrogenase enzyme activity, which were recorded every three months.

Results and Discussion

Shoot length (cm)

The shoot length showed significant differences as influenced by different threshing methods, processing operations and their interaction effects at different months of storage period are presented in Table 1. The shoot length decreased with the advancement of storage period in all the treatments. Whereas, initially highest shoot length was recorded in T_1 (16.24 cm), P_3 (15.63 cm) and T_1P_3 (16.44 cm) and lowest was in T_3 (14.14 cm), P_1 (14.96 cm) and T_3P_1 (13.79 cm). At the end of nine months of storage period, highest shoot length was recorded in T_1 (13.37 cm), P_3 (12.87 cm) and T_1P_3 (13.54 cm) while, significantly lowest shoot length was recorded in T_3 (11.64 cm), P_1 (12.31 cm) and T_3P_1 (11.36 cm).

Root length (cm)

The root length showed significant differences as influenced by different threshing methods, processing operations and their interaction effects at different months of storage period are presented in Table 2. The root length decreased with the advancement of storage period in all the treatments. Whereas, initially highest root length was recorded in T_1 (18.05 cm), P_3 (17.37 cm) and T_1P_3 (15.05 cm) and lowest was in T_3 (15.72 cm), P_1 (16.62 cm) and T_3P_1 (15.33 cm). At the end of nine months of storage period, highest shoot length was recorded in T_1 (14.86 cm), P_3 (14.31 cm) and T_1P_3 (15.05 cm) while, significantly lowest shoot length was recorded in T_3 (12.94 cm), P_1 (13.69 cm) and T_3P_1 (12.62 cm).

The decline in seedling length may be attributed to age induced decline in germination. The damage caused by fungal infection and also production of toxic metabolites hindered the seedling growth. Increase of abnormal seedlings over a storage period. These findings are in agreement with the results obtained by Poonam Singh *et al.* (2004) [8] in rice and Vijaykumar *et al.* (2007) [12] in cotton.

Seedling dry weight (mg)

The results of seedling dry weight as influenced by different threshing methods, processing operations and their interaction effects at different months of storage period are presented in Table 3. The seedling vigour index decreased with the advancement of storage period in all the treatments. Whereas, initially higher seedling dry weight was recorded in T_1 (614.93 mg) and P_3 (611.43 mg) and T_1P_3 (618.50 mg) and lower was in T_3 (599.50 mg), P_1 (604.80 mg) and T_3P_1 (595.70 mg). At the end of nine months of storage period, highest seedling dry weight was recorded in T_1 (590.65 mg), P_3 (587.29 mg) and T_1P_3 (594.07 mg) while, significantly lower seedling dry weight was recorded in T_3 (575.82 mg), P_1 (580.91 mg) and T_3P_1 (572.17 mg).

Differences in shoot length and root length among the processed seeds may be due to the difference in seed size and extent of mechanical injury. This was supported by various findings by Hesse and Peske (1981) [4], Moreano *et al.* (2018) [7] in soybean. The soybean crop threshed by multi-crop thresher with 300 rpm and seeds processed using air screen cleaner followed by gravity separator, and spiral separator (T_1P_3) recorded significantly highest seedling length, dry matter content and vigour index than other combinations. This could be attributed to less percentage of mechanical damage to these seeds. Mechanical damage to the seed may be one of the causes for reduction in length of seedlings of soybean. The threshing produces breaks, cracks, bruises and abrasions in seeds which in turn results in abnormal seedlings of questionable planting value. These results are in conformity with the findings of Kausal *et al.* (2006) [5] in soybean.

It was noticed that seedling length, dry matter content and vigour index were decreased as the storage period advanced. The decrease in length of seedlings could be ascribed to the ageing or deterioration of seed, which is progressive process, accompanied by accumulation of metabolites and progressively decrease germination and growth of seedlings with increased age (Floris, 1970) [3] and ultimately reducing the dry matter and vigour of soybean seed during storage. Seedling growth is considered to be an important tool that can be used for assessing the magnitude of deterioration (Toole *et al.*, 1957) [11].

Table 1: Effect of threshing methods and processing operations on shoot length (cm) in soybean variety DSb-21 during storage

Treatments	Months after storage									
	Initial Nov 2022	**1 Dec 2022**	**2 Jan 2023**	**3 Feb 2023**	**4 March 2023**	**5 April 2023**	**6 May 2023**	**7 June 2023**	**8 July 2023**	**9 Aug 2023**
Threshing methods (T)										
T_1	16.24	16.14	16.03	15.84	15.50	15.13	14.74	14.30	13.84	13.37
T_2	15.45	15.36	15.25	15.07	14.75	14.40	14.03	13.60	13.17	12.72
T_3	14.14	14.05	13.96	13.79	13.50	13.18	12.83	12.45	12.05	11.64
Mean	15.27	15.18	15.08	14.90	14.59	14.24	13.87	13.45	13.02	12.58
S.Em±	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01
C.D. @ 1%	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.04
Processing operations (P)										
P_1	14.96	14.87	14.77	14.59	14.28	13.94	13.58	13.17	12.75	12.31
P_2	15.24	15.15	15.04	14.86	14.55	14.20	13.83	13.42	12.99	12.55
P_3	15.63	15.54	15.43	15.25	14.93	14.57	14.19	13.76	13.32	12.87
Mean	15.27	15.18	15.08	14.90	14.59	14.24	13.87	13.45	13.02	12.58
S.Em±	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01
C.D. @ 1%	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.04
Interaction (T×P)										
T_1P_1	16.12	16.02	15.91	15.72	15.39	15.02	14.63	14.19	13.74	13.27
T_1P_2	16.15	16.06	15.95	15.76	15.43	15.06	14.66	14.22	13.77	13.30
T_1P_3	16.44	16.34	16.23	16.04	15.70	15.32	14.92	14.48	14.01	13.54
T_2P_1	14.96	14.87	14.77	14.59	14.28	13.94	13.58	13.17	12.75	12.32
T_2P_2	15.63	15.54	15.43	15.24	14.92	14.56	14.19	13.76	13.32	12.87
T_2P_3	15.77	15.67	15.56	15.38	15.05	14.69	14.31	13.88	13.44	12.98
T_3P_1	13.79	13.71	13.62	13.45	13.17	12.86	12.52	12.15	11.76	11.36
T_3P_2	13.93	13.85	13.75	13.59	13.30	12.98	12.65	12.27	11.87	11.47
T_3P_3	14.69	14.60	14.50	14.33	14.02	13.69	13.33	12.93	12.52	12.09
Mean	15.27	15.18	15.08	14.90	14.59	14.24	13.87	13.45	13.02	12.58
S.Em±	0.02	0.02	0.02	0.02	0.02	0.02	0.02	0.02	0.02	0.02
C.D. @ 1%	0.09	0.09	0.09	0.09	0.09	0.09	0.09	0.08	0.08	0.08

Table 2: Effect of threshing methods and processing operations on root length (cm) in soybean variety DSb-21 during storage

Treatments	Months after storage									
	Initial Nov 2022	**1 Dec 2022**	**2 Jan 2023**	**3 Feb 2023**	**4 March 2023**	**5 April 2023**	**6 May 2023**	**7 June 2023**	**8 July 2023**	**9 Aug 2023**
Threshing methods (T)										
T_1	18.05	17.94	17.82	17.60	17.23	16.82	16.38	15.89	15.38	14.86
T_2	17.17	17.07	16.95	16.75	16.40	16.01	15.59	15.12	14.64	14.14
T_3	15.72	15.62	15.51	15.33	15.01	14.65	14.27	13.84	13.39	12.94
Mean	16.98	16.88	16.76	16.56	16.21	15.82	15.41	14.95	14.47	13.98
S.Em±	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01
C.D. @ 1%	0.06	0.06	0.06	0.06	0.06	0.06	0.06	0.05	0.05	0.05
Processing operations (P)										
P_1	16.62	16.53	16.41	16.22	15.88	15.49	15.09	14.64	14.17	13.69
P_2	16.94	16.84	16.72	16.52	16.17	15.79	15.38	14.91	14.44	13.95
P_3	17.37	17.27	17.15	16.95	16.59	16.19	15.77	15.30	14.81	14.31
Mean	16.98	16.88	16.76	16.56	16.21	15.82	15.41	14.95	14.47	13.98
S.Em±	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01
C.D. @ 1%	0.06	0.06	0.06	0.06	0.06	0.06	0.06	0.05	0.05	0.05
Interaction (T×P)										
T_1P_1	17.92	17.81	17.69	17.47	17.11	16.70	16.26	15.77	15.27	14.75
T_1P_2	17.96	17.85	17.73	17.52	17.15	16.74	16.30	15.81	15.31	14.79
T_1P_3	18.27	18.17	18.04	17.82	17.45	17.03	16.59	16.09	15.58	15.05
T_2P_1	16.63	16.53	16.41	16.22	15.88	15.50	15.09	14.64	14.17	13.69
T_2P_2	17.37	17.27	17.15	16.94	16.59	16.19	15.77	15.30	14.81	14.30
T_2P_3	17.52	17.42	17.30	17.09	16.73	16.33	15.91	15.43	14.94	14.43
T_3P_1	15.33	15.24	15.14	14.96	14.64	14.29	13.92	13.50	13.07	12.62
T_3P_2	15.49	15.39	15.29	15.11	14.79	14.43	14.06	13.64	13.20	12.75
T_3P_3	16.33	16.23	16.12	15.92	15.59	15.22	14.82	14.38	13.92	13.44
Mean	16.98	16.88	16.76	16.56	16.21	15.82	15.41	14.95	14.47	13.98
S.Em±	0.03	0.03	0.03	0.03	0.02	0.02	0.02	0.02	0.02	0.02
C.D. @ 1%	0.10	0.10	0.10	0.10	0.10	0.10	0.10	0.09	0.09	0.09

Table 3: Effect of threshing methods and processing operations on seedling dry weight (mg) in soybean variety DSb-21 during storage

Treatments	Months after storage									
	Initial Nov 2022	1 Dec 2022	2 Jan 2023	3 Feb 2023	4 March 2023	5 April 2023	6 May 2023	7 June 2023	8 July 2023	9 Aug 2023
Threshing methods (T)										
T_1	614.93	613.09	611.74	608.68	605.64	602.61	599.60	596.60	593.62	590.65
T_2	608.67	606.84	605.51	602.48	599.47	596.47	593.49	590.52	587.57	584.63
T_3	599.50	597.70	596.39	593.40	590.44	587.49	584.55	581.63	578.72	575.82
Mean	607.70	605.88	604.54	601.52	598.51	595.52	592.54	589.58	586.63	583.70
S.Em±	0.06	0.06	0.06	0.06	0.06	0.06	0.06	0.06	0.06	0.06
C.D. @ 1%	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.24	0.24
Processing operations (P)										
P_1	604.80	602.99	601.66	598.65	595.66	592.68	589.72	586.77	583.83	580.91
P_2	606.87	605.05	603.71	600.70	597.69	594.70	591.73	588.77	585.83	582.90
P_3	611.43	609.60	608.26	605.22	602.19	599.18	596.18	593.20	590.24	587.29
Mean	607.70	605.88	604.54	601.52	598.51	595.52	592.54	589.58	586.63	583.70
S.Em±	0.06	0.06	0.06	0.06	0.06	0.06	0.06	0.06	0.06	0.06
C.D. @ 1%	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.24	0.24
Interaction (T×P)										
T_1P_1	611.50	609.67	608.32	605.28	602.26	599.24	596.25	593.27	590.30	587.35
T_1P_2	614.80	612.96	611.61	608.55	605.51	602.48	599.47	596.47	593.49	590.52
T_1P_3	618.50	616.64	615.29	612.21	609.15	606.10	603.07	600.06	597.06	594.07
T_2P_1	607.20	605.38	604.05	601.03	598.02	595.03	592.06	589.10	586.15	583.22
T_2P_2	608.50	606.67	605.34	602.31	599.30	596.31	593.32	590.36	587.41	584.47
T_2P_3	610.30	608.47	607.13	604.09	601.07	598.07	595.08	592.10	589.14	586.20
T_3P_1	595.70	593.91	592.61	589.64	586.70	583.76	580.84	577.94	575.05	572.17
T_3P_2	597.30	595.51	594.20	591.23	588.27	585.33	582.40	579.49	576.59	573.71
T_3P_3	605.50	603.68	602.36	599.34	596.35	593.37	590.40	587.45	584.51	581.59
Mean	607.70	605.88	604.54	601.52	598.51	595.52	592.54	589.58	586.63	583.70
S.Em±	0.11	0.11	0.11	0.11	0.11	0.11	0.10	0.10	0.10	0.10
C.D. @ 1%	0.44	0.44	0.44	0.43	0.43	0.43	0.43	0.42	0.42	0.42

References

1. Alvarez PJC, Krzyzanowski FC, Mandarino JMG, Franca-Neto JB. Relationship between soybean seed coat lignin content and resistance to mechanical damage. Seed Sci Technol. 1997;25(2):209-214.
2. FAO. Food and Agriculture Data. Food and Agriculture Organization of the United Nations, USA. 2020. Available from: http://www.fao.org/faostat/en/#home
3. Floris C. Ageing in *Triticum durum* seeds: Behavior of embryos and endosperm from aged seeds as revealed by the embryo transplantation technique. J Exp Bot. 1970;21:462-468.
4. Hesse SR, Peske ST. Spiral separator for removal of small bean seeds in soybean seeds. Seed Technol. 1981;1(2):118-122.
5. Kausal RT, Jagtap AP, Patil BN, Pavitrakar NRA, Rathod TH. Management of mechanical damage to soybean seeds during threshing. Ann Plant Physiol. 2006;20(1):74-77.
6. Mahesha CR, Channaveeraswami AS, Kurdikeri MB, Shekhargouda M, Merwade MN. Seed maturation studies in sunflower genotypes. Seed Res. 2001;29(1):95-97.
7. Moreano TB, Marques OJ, Braccini AL, Scapim CA, Franca-Neto JDB, Krzyzanowski FC. Evolution of the physical and physiological quality of soybean seeds during processing. J Seed Sci. 2018;40:313-322.
8. Singh P, Maurya CL, Gaura K, Bajpai VP. Effect of biological and chemical fungicides on longevity of rice hybrid (DRRH-1) and its parental line seeds. Seed Res. 2004;32(2):177-179.
9. Prakobbon N. Role of mechanical damage in deterioration of soybean seed quality during storage: A review. Agric Rev. 1982;29(3):177-184.
10. Puteh AB, Tekrony DM, Egli DB. Expression of cotyledon necrosis in deteriorating soybean [*Glycine max* (L.)] seed. Seed Sci Technol. 1997;25(1):133-145.
11. Toole EH, Toole VK, Borthwick HA. Growth and production of snap beans stored under favourable and unfavourable conditions. Proc Int Seed Test Ass. 1957;22:418-425.
12. Vijaykumar K, Ravi H, Biradar Patil NK, Vyakarnahal BS. Effect of seed coating with polymer, fungicide and insecticide on seed quality in cotton during storage. Karnataka J Agric Sci. 2007;20(1):137-139.