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Effect of integrated nutrient management on seed quality of vegetable soybean [*Glycine max* (L.) Merrill] cv. Karune

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ABSTRACT

A laboratory experiment was conducted at the Department of Seed Science and Technology, GKVK, University of Agricultural Sciences, Bangalore. The results revealed that, application of recommended dose of NPK (30:80: 37.5 kg ha^{-1}) + Recommended dose of FYM (10 t ha^{-1}) +*Brady rhizobium* (250 g ha^{-1})+PSB (250 g ha^{-1}) significantly improved the seed quality parameters *viz.*, 100 seed weight (35.51g), seed size (0.76 cm^3), seed density (1.55 g/cc), total dehydrogenase activity (4.80), germination (92.00 %), seedling length (30.69 cm), seedling dry weight (90.75 mg), seedling vigour index- I and II (2820 and 836 respectively), protein content (36.30 %) and field emergence (89.33 %) with lowest electrical conductivity (0.49 $mScm^{-1}$) as compared to control and other treatments. Further, artificially aged seeds through accelerated ageing method also recorded higher seed quality parameters in the same treatment at the end of six days of ageing period.

Key words: *Brady rhizobium*, FYM, Nutrient, Seed quality, Soybean, Vermicompost.

INTRODUCTION

A wonder crop soybean [*Glycine max* (L.) Merrill] is a grain legume considered as the miracle crop of 21th century or 'Golden bean' because of its versatile nutritional qualities having 20 per cent oil and 38-42 per cent high quality protein possessing high level of essential amino acids. Vegetable soybean newly introduced crop is gaining importance in recent years because of its rich protein content and can be used as vegetable by common man in his routine diet. It is also 'treated as manmade meat' because of its rich source of protein and fat.

In soybean, seed quality deteriorates due to many reasons which results in poor germination. One such reason could be probably improper mother plant nutrition. So, in order to improve the seed quality, better nutritional management practices play an important role and that too in the era of organic farming, integrated use of organic and inorganic nutrients plays a decisive role in getting higher seed yield as well as better seed quality. Therefore, the present investigation was undertaken.

MATERIALS AND METHODS

A field experiment was conducted at the Department of Seed Science and Technology, College of Agriculture, GKVK, University of Agricultural Sciences, Bangalore. There were twelve treatments and laid out in randomized block design with three replications. The treatments combination were as follows

T_1 : RDF (30:80:37.5 kg/ha)
T_2 : T_1+Recommended dose of FYM (10 t ha^{-1})
T_3: T_2 + *Brady rhizobium* (250 g ha^{-1})
T_4: T_2 + PSB (250 g ha^{-1})
T_5: T_2 + *Brady rhizobium* (250 g ha^{-1}) + PSB (250 g ha^{-1})
T_6: T_1 + Vermicompost (4 t ha^{-1})
T_7: T_6 + *Brady rhizobium* (250 g ha^{-1})
T_8: T_6 + PSB (250 g ha^{-1})
T_9: T_6+*Brady rhiz*[1]*obium* (250 g ha^{-1})+ PSB (250 g ha^{-1})
T_{10}: 50% RDF (15:40:18.75 kg ha^{-1}) + Recommended dose of FYM (10 t ha^{-1}) +*Brady rhizobium* (250 g ha^{-1})+PSB (250 g ha^{-1})
T_{11}: 50% RDF(15:40:18.75 kg ha^{-1}) + Vermicompost (4 t ha^{-1}) + *Brady rhizobium* (250 g ha^{-1}) + PSB (250 g ha^{-1})
T_{12}: 50% RDF(15:40:18.75 kg ha^{-1}) + 50% Recommended dose of FYM (5 t ha^{-1}) + 50% Vermicompost (2 t ha^{-1}) + *Brady rhizobium* (250 g ha^{-1}) + PSB (250 g ha^{-1}).

The crop was harvested treatment wise at physiological maturity based on maturity indices (yellowing of pods and leaves). The harvested plants from each treatment and replication were sun dried separately and threshed manually. The seed samples were collected treatment wise and further sun dried to reduce moisture content to optimum level (8-9 %) and following seed quality observations were recorded.

Evaluation of seed quality parameters: Germination per cent was determined as per ISTA rules for seed testing. The seeds were placed in rolled paper towels. Hundred seeds of

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four replications were tested at a constant temperature of 25°C. The number of normal seedlings was evaluated on 8th day and per cent germination was expressed on normal seedling basis (Anonymous 2013).

From the standard germination, shoot length was measured from collar region to the point of attachment of cotyledons and root length from the collar region to the tip of the primary root, sum of shoot and root length constitute the seedling length and mean was calculated and expressed in centimeters. Seedling vigour index was computed by adopting the formula as suggested by Abdul-Baki and Anderson (1973) and expressed as whole number.

Seedling vigour index-I =

Germination (%) x Mean seedling length (cm).

Seedling vigour index-I =

Germination (%) x Seedling dry weight (mg)

Field emergence was calculated by sowing one hundred seeds from each treatment in four replications in the field. The emergence counts were made on 8th day after sowing and expressed in per cent (ISTA, 2006). Other seed quality parameters were determined as per ISTA rules for seed testing (ISTA, 2006). Oil analysis of soybean seeds was estimated by NMR (Nuclear Magnetic Resonance) method. Change in oil content among the treatments is expressed as percentage by weight basis and the total soluble protein was estimated as per the method prescribed by Lowry *et al*. (1951).

In accelerated ageing test, the required quantity of resultant seeds from each treatment were subjected to accelerated ageing by incubating at 40±1°C and 90 per cent relative humidity for 2 and 6 days in single layer on a perforated wire mesh in a thermostatisticaly controlled ageing chamber. The aged seeds were taken out and dried to their original moisture content. Dried seeds were subjected for quality test (Delouche and Baskin 1973). The statistical analysis and the interpretation of the experimental data was done by using Fischer's method of Analysis of Variance technique as outlined by Gomez and Gomez (1984) and the level of significance used in 'F' and 't' test was five per cent.

RESULTS AND DISCUSSION

Assessment of seed quality parameters of resultant seed crop is rather essential segment to determine the planting value and the performance of seeds due to treatments. The combined application of inorganic and organic nutrients significantly influenced the seed quality.

The maximum 100 seed weight (35.51g), seed size (0.76 cm^3), seed density (1.55 g/cc), highest total dehydrogenase activity (4.80), protein content (36.30 %), field emergence (89.33 %) and lower electrical conductivity (0.49 $mScm^{-1}$) were observed with the application of (T_5) recommended dose of NPK (30:80: 37.5 kg ha^{-1}) + Recommended dose of FYM (10 t ha^{-1}) + *Brady rhizobium* (250g ha^{-1}) + PSB (250 g ha^{-1}). However, lowest seed quality parameters were recorded with the application of (T_1) recommended dose of NPK (30:80: 37.5 kg/ha) (30.58 g, 0.68 cm^3, 2.95, 34.27 %, 76.67 %, 0.974 $mScm^{-1}$respectively) (Table 1 and 2). The higher seed quality parameters due to combined application might be attributed to the fact that higher nutrition resulted in development of high quality seeds with more amount of food reserve material due to availability of adequate nutrients right from fertilization until maturity. The highest protein content might be due to the action of bioagents which helped in better uptake of nitrogen and mobilization as well as continuously supply and slow release through organic manures resulted in synthesis of more protein than other treatments. Lower EC was because of increased phosphate content due to applied P solubalizers and involvement in the membrane integrity (Maheshbabu *et al*., 2008; Virkar and Tumbare, 2011 and Waghmare *et al*., 2011).

Seedling vigour index-I and II were differed significantly among the treatments. Higher seedling vigour index-I and II was recorded in T_5 which consisted of recommended dose of NPK (30:80:37.5 kg ha^{-1}) + Recommended dose of FYM (10 t ha^{-1}) + *Brady rhizobium* (250g ha^{-1}) + PSB (250g ha^{-1}) (2820 and 836) and it was lowest with the application of (T_1) recommended dose of NPK (30:80:37.5 kg ha^{-1}) (2020 and 632 respectively). This increase in seedling vigour index-I and II might be due to increase in germination (92.00 %), seedling length (30.69) and seedling dry weight (90.75 mg) (Table 3 and 4). Higher germination percentage might be due to bolder seeds that contain greater metabolites for resumption of embryonic growth during germination and better accumulation of food reserves like protein and carbohydrates. The increase in seedling length might be due to increase in root length and shoot length which in turn is attributed to presence of higher amount of stored food material, is reflected in higher test weight. Maheshbabu *et al*. (2008) and Renugadevi and Balamurugan (2002) reported that germination percentage and seedling vigour index I and II increase with the combined application of inorganic, organic manures and biofertilizers.

The data did not differ significantly due to treatments with respect to oil content., However, maximum (18.16 %) oil content was noticed in T_1 compared to other treatments (Table 2) (Sumit Chaturvedi *et al.*, 2010 and Waghmare *et al*., 2011).

At different periods of AA test, T_5 recorded highest germination per cent (70.83%), SVI-I (1388), SVI-II (485),

Table 1: Effect of integrated nutrient management on seed quality in vegetable soybean cv. Karune

Treatments	**Seed size (cm^3)**	**Seed density (g/cc)**	**Seed Index (g)**	**Electrical Conductivity ($mScm^{-1}$)**
T_1: RDF (30:80:37.5 kg/ha)	0.68	0.79	30.58	0.97
T_2: T_1+Recommended dose of FYM (10 t ha^{-1})	0.73	0.88	32.55	0.60
T_3: T_2 + *Brady rhizobium* (250 g ha^{-1})	0.73	1.07	32.65	0.74
T_4: T_2 + PSB (250 g ha^{-1})	0.73	1.11	32.50	0.52
T_5: T_2 + *Brady rhizobium* (250 g ha^{-1}) + PSB (250 g ha^{-1})	0.76	1.55	35.51	0.49
T_6: T_1 + Vermicompost (4 t ha^{-1})	0.70	0.95	32.39	0.88
T_7: T_6 + *Brady rhizobium* (250 g ha^{-1})	0.72	0.91	32.39	0.56
T_8: T_6 + PSB(250 g ha^{-1})	0.73	1.00	31.92	0.56
T_9: T_6+*Brady rhizobium* (250 g ha^{-1})+ PSB (250 g ha^{-1})	0.69	0.95	33.06	0.86
T_{10}: 50% RDF (15:40:18.75 kg ha^{-1}) + Recommended dose of FYM (10 t ha^{-1}) +*Brady rhizobium* (250 g ha^{-1})+PSB (250 g ha^{-1})	0.73	1.00	31.54	0.69
T_{11}: 50% RDF(15:40:18.75 kg ha^{-1})+ Vermicompost (4 t ha^{-1})+ *Brady rhizobium* (250 g ha^{-1}) + PSB (250 g ha^{-1})	0.73	0.91	31.22	0.67
T_{12}: 50% RDF(15:40:18.75 kg ha^{-1}) + 50% Recommended dose of FYM (5 t ha^{-1}) + 50% Vermicompost (2 t ha^{-1}) + *Brady rhizobium* (250 g ha^{-1}) + PSB (250 g ha^{-1})	0.71	1.46	33.39	0.78
Mean	**0.72**	**1.05**	**32.47**	**0.69**
S. Em±	0.02	0.03	0.56	0.01
C.D (P=0.05)	NS	0.09	1.63	0.03
CV (%)	4.03	4.81	2.98	2.41

Table 2: Effect of integrated nutrient management on seed quality in vegetable soybean cv. Karune

Treatments	**TDH Activity (A_{480})**	**Field Emergence (%)**	**Oil content (%)**	**Protein content (%)**
T_1: RDF (30:80:37.5 kg/ha)	2.95	76.67	18.16	34.27
T_2: T_1+Recommended dose of FYM (10 t ha^{-1})	3.69	78.67	17.76	35.10
T_3: T_2 + *Brady rhizobium* (250 g ha^{-1})	3.65	80.33	17.62	35.40
T_4: T_2 + PSB (250 g ha^{-1})	3.72	83.67	17.77	35.53
T_5: T_2 + *Brady rhizobium* (250 g ha^{-1}) + PSB (250 g ha^{-1})	4.80	89.33	17.81	36.30
T_6: T_1 + Vermicompost (4 t ha^{-1})	3.41	84.33	17.75	35.47
T_7: T_6 + *Brady rhizobium* (250 g ha^{-1})	3.06	85.33	17.63	36.13
T_8: T_6 + PSB(250 g ha^{-1})	3.89	83.33	17.74	35.17
T_9: T_6+*Brady rhizobium* (250 g ha^{-1})+ PSB (250 g ha^{-1})	4.31	87.67	17.93	36.32
T_{10}: 50% RDF (15:40:18.75 kg ha^{-1}) + Recommended dose of FYM (10 t ha^{-1}) +*Brady rhizobium* (250 g ha^{-1})+PSB (250 g ha^{-1})	4.40	81.00	17.48	35.47
T_{11}: 50% RDF(15:40:18.75 kg ha^{-1})+ Vermicompost (4 t ha^{-1})+ *Brady rhizobium* (250 g ha^{-1}) + PSB (250 g ha^{-1})	4.39	84.00	17.80	35.80
T_{12}: 50% RDF(15:40:18.75 kg ha^{-1}) + 50% Recommended dose of FYM (5 t ha^{-1}) + 50% Vermicompost (2 t ha^{-1}) + *Brady rhizobium* (250 g ha^{-1}) + PSB (250 g ha^{-1})	4.59	87.00	17.33	35.07
Mean	**3.91**	**83.44**	17.73	**35.50**
S. Em±	0.08	2.49	0.14	0.53
C.D (P=0.05)	0.24	7.30	NS	NS
CV (%)	3.70	5.16	1.41	2.59

field emergence (67.33%), higher total dehydrogenase activity (1.14) with lower electrical conductivity (1.80 mSm^{-1}) at the end of 6 days of ageing compared T_1 (59.96 %, 901, 335, 58.67 %, 0.85 and 2.59 mSm^{-1}, respectively) (Table 5, 6 and 7). As ageing advanced, decline in germination and other vigour parameters were observed. The higher seed quality parameters might be due to supply of more nutrients because of combined application of organic and inorganics in turn resulted in proper development of seed and accumulation of more food reserves by efficient translocation of photosynthates by co-inoculation of biofertilizers leading to adequate supply food

Table 3: Effect of integrated nutrient management on seed quality in vegetable soybean cv. Karune

Treatments	Germination (%)	Root length (cm)	Shoot length (cm)	Seedling length (cm)
T_1: RDF (30:80:37.5 kg/ha)	79.00	14.01	11.58	25.56
T_2: T_1+Recommended dose of FYM (10 t ha^{-1})	82.50	15.43	13.43	28.86
T_3: T_2 + *Brady rhizobium* (250 g ha^{-1})	83.00	16.55	12.22	28.77
T_4: T_2 + PSB (250 g ha^{-1})	84.50	17.23	12.64	29.95
T_5: T_2 + *Brady rhizobium* (250 g ha^{-1}) + PSB (250 g ha^{-1})	92.00	17.34	13.34	30.69
T_6: T_1 + Vermicompost (4 t ha^{-1})	89.50	13.88	12.86	26.74
T_7: T_6 + *Brady rhizobium* (250 g ha^{-1})	85.00	16.38	12.75	29.13
T_8: T_6 + PSB(250 g ha^{-1})	84.00	15.41	11.00	26.39
T_9: T_6+*Brady rhizobium* (250 g ha^{-1})+ PSB (250 g ha^{-1})	83.50	16.56	10.75	27.26
T_{10}: 50% RDF (15:40:18.75 kg ha^{-1}) + Recommended dose of FYM (10 t ha^{-1}) +*Brady rhizobium* (250 g ha^{-1})+PSB (250 g ha^{-1})	86.50	16.13	14.50	30.61
T_{11}: 50% RDF(15:40:18.75 kg ha^{-1})+ Vermicompost (4 t ha^{-1})+ *Brady rhizobium* (250 g ha^{-1}) + PSB (250 g ha^{-1})	84.50	17.25	11.06	28.33
T_{12}: 50% RDF(15:40:18.75 kg ha^{-1}) + 50% Recommended dose of FYM (5 t ha^{-1}) + 50% Vermicompost (2 t ha^{-1}) + *Brady rhizobium* (250 g ha^{-1}) + PSB (250 g ha^{-1})	91.00	17.19	13.32	30.27
Mean	**85.42**	**16.11**	**12.45**	**28.54**
S. Em±	1.71	0.31	0.29	0.55
C.D (P=0.05)	4.91	0.88	0.83	1.59
CV (%)	4.01	3.79	4.62	3.88

Table 4: Effect of integrated nutrient management on seed quality in vegetable soybean cv. Karune

Treatments	Seedling dry weight (mg)	Vigour Index-I	Vigour Index-II
T_1: RDF (30:80:37.5 kg/ha)	80.00	2020	632
T_2: T_1+Recommended dose of FYM (10 t ha^{-1})	87.98	2380	725
T_3: T_2 + *Brady rhizobium* (250 g ha^{-1})	85.25	2388	708
T_4: T_2 + PSB (250 g ha^{-1})	89.00	2533	753
T_5: T_2 + *Brady rhizobium* (250 g ha^{-1}) + PSB (250 g ha^{-1})	90.75	2820	836
T_6: T_1 + Vermicompost (4 t ha^{-1})	87.75	2395	784
T_7: T_6 + *Brady rhizobium* (250 g ha^{-1})	82.50	2474	704
T_8: T_6 + PSB(250 g ha^{-1})	83.25	2217	700
T_9: T_6+*Brady rhizobium* (250 g ha^{-1})+ PSB (250 g ha^{-1})	88.25	2275	737
T_{10}: 50% RDF (15:40:18.75 kg ha^{-1}) + Recommended dose of FYM (10 t ha^{-1}) +*Brady rhizobium* (250 g ha^{-1})+PSB (250 g ha^{-1})	88.00	2645	760
T_{11}: 50% RDF(15:40:18.75 kg ha^{-1})+ Vermicompost (4 t ha^{-1})+ *Brady rhizobium* (250 g ha^{-1}) + PSB (250 g ha^{-1})	82.25	2399	683
T_{12}: 50% RDF(15:40:18.75 kg ha^{-1}) + 50% Recommended dose of FYM (5 t ha^{-1}) + 50% Vermicompost (2 t ha^{-1}) + *Brady rhizobium* (250 g ha^{-1}) + PSB (250 g ha^{-1})	86.00	2754	784
Mean	**85.91**	**2442**	**734**
S. Em±	2.08	46.82	13.06
C.D (P=0.05)	5.97	134.29	37.46
CV (%)	4.84	3.84	3.56

reserves during seed germination. Slower deterioration of seeds in AA test is due to absorption of less moisture and its higher membrane integrity because of high phosphorous content in plant system due to applied phosphorous solubalizers and lower respiration rate. Higher germination, seedling length and seedling dry weight in seeds obtained from the above treatment could be attributed to maximum seedling vigour index-I and II (Macros Filho and Mc Donald, 1998 and Renukamma, 2003). With the advancement in period of accelerated ageing, there was decrease in germination, seedling length and vigour of seeds. Physiological deterioration of seed vigour might be the outcome of deterioration at various levels in the enzyme activity and seed composition. Enzymes are considered to be the catalysts of all biochemical activities and any amount of reduction or retardation either in the quantity or activity of enzymes produced at various sites in the seed may reduce the synthesis of amino acid, nucleic acid and other valuable nutrients necessary for growth and development.

Table 5: Effect of integrated nutrient management on seed quality of vegetable soybean cv. Karune after accelerated ageing test

Treatments	Electrical conductivity ($mScm^{-1}$)			Total dehydrogenase activity		
	Period of ageing (AA)			Period of ageing (AA)		
	0 days	2 days	6 days	0 days	2 days	6 days
T_1: RDF (30:80:37.5 kg/ha)	0.97	1.63	2.59	2.26	1.74	0.85
T_2: T_1+Recommended dose of FYM (10 t ha^{-1})	0.60	1.30	1.95	2.10	1.67	0.88
T_3: T_2 + *Brady rhizobium* (250 g ha^{-1})	0.74	1.00	1.89	2.00	1.96	1.12
T_4: T_2 + PSB (250 g ha^{-1})	0.52	1.17	2.26	2.27	1.97	0.97
T_5: T_2 + *Brady rhizobium* (250 g ha^{-1}) + PSB (250 g ha^{-1})	0.49	0.94	1.80	2.55	2.47	1.14
T_6: T_1 + Vermicompost (4 t ha^{-1})	0.88	1.32	2.12	2.40	2.35	0.78
T_7: T_6 + *Brady rhizobium* (250 g ha^{-1})	0.56	1.35	1.93	2.19	1.72	0.91
T_8: T_6 + PSB(250 g ha^{-1})	0.56	1.19	1.98	2.39	1.90	0.71
T_9: T_6+*Brady rhizobium* (250 g ha^{-1})+ PSB (250 g ha^{-1})	0.86	1.22	1.87	2.55	2.50	0.84
T_{10}: 50% RDF (15:40:18.75 kg ha^{-1}) + Recommended dose of FYM (10 t ha^{-1}) +*Brady rhizobium* (250 g ha^{-1})+PSB (250 g ha^{-1})	0.69	1.22	2.17	2.49	2.32	0.80
T_{11}: 50% RDF(15:40:18.75 kg ha^{-1})+ Vermicompost (4 t ha^{-1})+ *Brady rhizobium* (250 g ha^{-1}) + PSB (250 g ha^{-1})	0.67	1.08	1.80	2.66	2.16	1.01
T_{12}: 50% RDF(15:40:18.75 kg ha^{-1}) + 50% Recommended dose of FYM (5 t ha^{-1}) + 50% Vermicompost (2 t ha^{-1}) + *Brady rhizobium* (250 g ha^{-1}) + PSB (250 g ha^{-1})	0.78	1.27	1.84	2.56	2.41	0.92
Mean	0.69	1.22	2.02	2.37	2.10	0.91
	S.Em ±	**C.D (P=0.05)**		**S.Em ±**	**C.D (P=0.05)**	
AA	0.01	0.03		0.02	0.05	
T	0.02	0.06		0.03	0.09	
T×AA	0.04	0.12		0.06	0.18	

Table 6: Effect of integrated nutrient management on seed quality of vegetable soybean cv. Karune after accelerated ageing test

Treatments	Field emergence (%)			Germination (%)		
	Period of ageing (AA)			Period of ageing (AA)		
	0 days	2 days	6 days	0 days	2 days	6 days
T_1: RDF (30:80:37.5 kg/ha)	74.67	71.33	58.67	77.67	75.80	59.96
T_2: T_1+Recommended dose of FYM (10 t ha^{-1})	76.00	77.33	60.00	79.67	73.75	59.17
T_3: T_2 + *Brady rhizobium* (250 g ha^{-1})	76.33	77.33	60.33	85.33	80.75	64.37
T_4: T_2 + PSB (250 g ha^{-1})	81.33	80.67	65.60	81.33	78.57	62.27
T_5: T_2 + *Brady rhizobium* (250 g ha^{-1}) + PSB (250 g ha^{-1})	85.67	84.67	67.33	87.00	84.78	70.83
T_6: T_1 + Vermicompost (4 t ha^{-1})	81.67	72.33	54.67	80.67	80.38	66.83
T_7: T_6 + *Brady rhizobium* (250 g ha^{-1})	80.67	78.00	67.33	78.67	75.35	61.85
T_8: T_6 + PSB(250 g ha^{-1})	81.33	81.67	64.33	76.33	75.19	62.00
T_9: T_6+*Brady rhizobium* (250 g ha^{-1})+ PSB (250 g ha^{-1})	84.33	83.33	59.00	81.33	73.90	61.50
T_{10}: 50% RDF (15:40:18.75 kg ha^{-1}) + Recommended dose of FYM (10 t ha^{-1}) +*Brady rhizobium* (250 g ha^{-1})+PSB (250 g ha^{-1})	78.00	77.67	65.67	84.50	78.33	61.16
T_{11}: 50% RDF(15:40:18.75 kg ha^{-1})+ Vermicompost (4 t ha^{-1})+ *Brady rhizobium* (250 g ha^{-1}) + PSB (250 g ha^{-1})	78.00	79.33	56.00	82.00	76.78	61.34
T_{12}: 50% RDF(15:40:18.75 kg ha^{-1}) + 50% Recommended dose of FYM (5 t ha^{-1}) + 50% Vermicompost (2 t ha^{-1}) + *Brady rhizobium* (250 g ha^{-1}) + PSB (250 g ha^{-1})	84.00	83.33	65.33	86.42	81.76	68.60
Mean	80.17	78.92	62.03	81.74	77.95	63.32
	S.Em ±	**C.D (P=0.05)**		**S.Em ±**	**C.D (P=0.05)**	
AA	1.05	2.95		0.51	1.44	
T	1.82	5.11		0.89	2.50	
T×AA	3.64	NS		1.78	5.01	

Table 7: Effect of integrated nutrient management on seed quality of vegetable soybean cv. Karune after accelerated ageing test.

Treatments	Seedling vigour index-I			Seedling vigour index-II		
	Period of ageing (AA)			Period of ageing (AA)		
	0 days	**2 days**	**6 days**	**0 days**	**2 days**	**6 days**
T_1: RDF (30:80:37.5 kg/ha)	1606	1559	901	606	559	335
T_2: T_1+Recommended dose of FYM (10 t ha^{-1})	1904	1314	911	680	605	366
T_3: T_2 + *Brady rhizobium* (250 g ha^{-1})	2048	1772	1030	711	641	361
T_4: T_2 + PSB (250 g ha^{-1})	2025	1832	1015	710	640	363
T_5: T_2 + *Brady rhizobium* (250 g ha^{-1}) + PSB (250 g ha^{-1})	2247	2025	1388	771	716	485
T_6: T_1 + Vermicompost (4 t ha^{-1})	1730	1665	1105	691	619	400
T_7: T_6 + *Brady rhizobium* (250 g ha^{-1})	1906	1560	920	633	587	351
T_8: T_6 + PSB(250 g ha^{-1})	1632	1659	1047	618	571	380
T_9: T_6+*Brady rhizobium* (250 g ha^{-1})+ PSB (250 g ha^{-1})	1774	1582	1180	699	621	344
T_{10}: 50% RDF (15:40:18.75 kg ha^{-1}) + Recommended dose of FYM (10 t ha^{-1}) +*Brady rhizobium* (250 g ha^{-1})+PSB (250 g ha^{-1})	2144	1653	918	726	629	386
T_{11}: 50% RDF(15:40:18.75 kg ha^{-1})+ Vermicompost (4 t ha^{-1})+ *Brady rhizobium* (250 g ha^{-1}) + PSB (250 g ha^{-1})	1926	1705	1019	664	585	349
T_{12}: 50% RDF(15:40:18.75 kg ha^{-1}) + 50% Recommended dose of FYM (5 t ha^{-1}) + 50% Vermicompost (2 t ha^{-1}) + *Brady rhizobium* (250 g ha^{-1}) + PSB (250 g ha^{-1})	2172	1925	1149	729	668	454
Mean	1926	1688	1049	687	620	381
	S.Em ±	**C.D (P=0.05)**		**S.Em ±**	**C.D (P=0.05)**	
AA	19.01	53.36		5.51	15.45	
T	32.93	92.42		9.54	26.77	
T×AA	65.86	184.85		19.07	53.54	

CONCLUSION

Considering the higher seed quality parameters, the treatment combination of recommended dose of NPK (30:80: 37.5 kg ha^{-1}) + Recommended dose of FYM (10 t ha^{-1}) + *Brady rhizobium* (250 g ha^{-1})+ PSB (250 g ha^{-1}) can be used for getting good quality seeds of vegetable soybean.

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