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Evaluation of integrated nutrient management on Seed quality parameters of field pea

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Abstract
Seed quality plays an important role in the crop establishment and overall performance of the crop. The present research study was conducted at the Seed testing laboratory of Sam Higginbottom Institute of Agriculture Technology and Sciences, Allahabad, Uttar Pradesh in 2015-2016. The data of research study revealed that the combination effect of inorganic fertilizers and biofertilizers were significant on seed quality parameters of field pea in which the treatment T_5 (100% RDF + Rhizobium@20g/kg seed) exhibited higher mean value for seed germination percentage (92.25 %), Root length (11.74 cm), Shoot length (10.48 cm), Seedling length (22.06 cm) and Seedling Vigour Index (2039.24) and minimum value was exhibited by T_3 (Pseudomonas@20g/kg seed) with respect of Germination percentage (84.50%), T_0 (control) with respect of Root length (9.26cm), Shoot length(8.53cm) and Seedling length(18.63cm), T_6 (100% RDF + Pseudomonas@20 kg/seed) with respect of Seedling Vigour Index(1623.18).

Keywords: Rhizobium, germination, seedling vigour, field pea

Introduction
Pea (*Pisum sativum* L.) is a cool season legume crop that is grown on over 25 million acres worldwide. Field pea or dry pea is marketed as a dry, shelled product for either human or livestock food. It is commonly used throughout the world in human diets and has high levels of amino acid, lysine and tryptophan, which are relatively low in cereal grains and contains approximately 21-25% protein. Being a legume crop and has the inherent ability to obtain much of its nitrogen requirement from the atmosphere by forming a symbiotic relationship with Rhizobium bacteria in the soil (Schatz and Endres, 2009) [13].

The basic concept of integrated nutrient management system is the maintenance of plant nutrients supply to achieve a given level of crop production by optimizing the benefits from all possible sources of plant nutrients in an integrated manner, appropriate to each cropping system and farming system (Mahajan and Sharma 2005) [7]. The advantage of combining organic and inorganic sources of nutrients in integrated nutrient management has been proved superior to the use of each component separately (Palaniappan and Annadurai 2007) [9].

Seed quality plays an important role in the crop establishment and overall performance of the crop. Availability of viable and vigorous seeds at the planting time is important for achieving targets of agricultural production because good quality seed acts as a catalyst for realizing the full potential of other inputs. The good quality seed is pre-requisite to enhance the production and productivity. Seed is an important component and the quality seed plays a crucial role in agricultural production as well as in national economy. Use of quality seeds increased productivity of crop by 15-20% (Sidhawani, 1991) [14].

Seed germination is usually the most critical stage in seedling establishment, determining successful crop production (Almansouri *et al.*, 2001) [1]. Germination at the right time and in the right place is important to determine the probability of a seedling surviving to maturity (Thompson, 1973) [15].

Seeds vigour comprises those properties, which determine the potential for rapid uniform emergence and development of normal seedlings under a wide range of field conditions. High seed and seedling vigour is required for a good stand establishment and successful crop performance in pea (ASPB, 2003) [3]. Keeping in this view the present research study was conduct to evaluate the Effect of Integrated Nutrient Management on seed quality parameters of field pea.

Material and method
The laboratory research study was conducted during 2015- 2016 in Seed Testing Laboratory at Allahabad School of Agriculture, Sam Higginbottom Institute of Agriculture, Technology & Science, Allahabad. The Pea variety PSM-3 was selected for this research trial and seed source of the research variety is Indian Institute of Pulse Research (IIPR) Kanpur (U.P.) India.

The experiment was carried out in complete randomized block design with 11 treatments included Bio fertilizers and Chemical fertilizers (N:P:K, Pseudomonas, Carbendazim and Rhizobium). The following seed quality parameters such as Germination percentage was observed with three replications of 100 seeds each for every treatment combination uniformly placed on moist germination paper in germination boxes and shifted to seed germinator maintained at 20° temperatures which recorded separately for each treatment and replication on final count (8th day) (Fritze, 1965) [19]. Shoot length (cm), root length (cm), Seedling length (cm) were observed with ten normal seedlings taken at random from each replication of the standard germination test after 8 days (Fiala, 1987) [18]. Seedling vigour index is computed by adopting the following formula as suggested by (Abdul Baki and Anderson, 1973) [17]. The Statistical analysis of variance was carried out according to the procedure of complete randomized block design for each character using ANOVA.

$$\text{Germination percentage} = \frac{\text{Total number of seed germinated}}{\text{Total number of seed planted}} \times 100$$

Seedling Vigour Index = Germination (%) x Seedling length (cm.)

Treatment		Treatment combination
T_0	=	control
T_1	=	100% RDF
T_2	=	Rhizobium@20g/kg seed
T_3	=	Pseudomonas@20g/kg seed
T_4	=	Carbendazim@3g/kg seed
T_5	=	100% RDF + Rhizobium@20g/kg seed
T_6	=	100% RDF + Psuedomonas@20g/kg seed
T_7	=	100% RDF + Carbendazim@3g/kg seed
T_8	=	Rhizobium@20g/kg seed + Psuedomonas@20g/kg seed
T_9	=	Rhizobium@20g/kg seed + Carbendazim@3g/kg seed
T_{10}	=	Psuedomonas@20g/kg seed + Carbendazim@3g/kg seed

Results and discussion

The results of the present investigation that the response of crop for different seed treatments were interpreted in terms of Germination percentage, root length (cm), shoot length (cm), seedling length (cm) and seed vigour index. The collected data were analyzed statistically to evaluate the significance of variation due to different seed treatments.

Seed Germination Percentage

The data revealed on the seed germination percentage of pea it is evident from the table 1 ranged from 83.67 to 92.67 with mean value of 88.33 in which significantly maximum increase in seed germination Percentage (92.67) was recorded in T_5. The enhanced seed germination and seed vigour indices may be due to the favorable C/N ratio and better availability of nutrients. Similar findings regarding integrated use of different chemical and biofertilizers showed significant increase in germination percent, root-shoot length of seedlings and SVI compared to non-treated plants. Amit Mishra *et al.*,(2018) [8] to evaluate of organic and inorganic fertilizer on mother plant treated with T_7 recorded higher are germination per cent (99%), root length (2.37 cm), shoot length (3.06 cm), seedling length (5.37 cm), vigour index I (531.95), vigour index II (3.60). Ashwani Kumar *et al.*, (2016) [2] to assess effect of inorganic fertilizers and biofertilizers inoculation on seed yield and quality of cowpea in which INM treated plot differed significantly for plant height, seed yield, number of pods/plant, pod length, number of seeds/pod, 1000-seed weight, seed germination and vigour indices.

Shoot length (cm)

The data revealed on the shoot length of pea it is evident from the table 1 ranged from 8.25 cm to 10.43 cm with mean value of 9.13 in which maximum shoot length (10.43 cm) was recorded in T_5. Deshpande (2008) [5] conducted experiment on Chickpea verities significant difference were observed on root and shoot length and vigor index. Raj Kumar Suman *et al.*, (2018) [11] revealed that the coriander genotypes COR-86 has been identified as the best genotype for the seed quality parameters *viz.*, seed test weight, germination (%), speed of germination (days-1), root length (cm), Shoot length (cm), seedling length (cm), seedling dry weight(gm.), seed vigour index length, seed vigour index mass and seed metabolic efficiency followed by genotype RKC-44 with all seed quality parameters respectively.

Root length (cm)

The data revealed on the root length it is evident from the table 1 ranged from 8.84 cm to 12.64 cm with mean value of 10.92 cm in which maximum root length (12.64 cm) was recorded in T_5. Yakkala Siva Sankar *et al.*, (2015) [16] conducted to the viability and vigour parameters of ten okra varieties were evaluated by following parameters such as root length, shoot length, seedling length, dry root weight, dry shoot weight, seedling dry weight, vigour index length. J. K. Beura *et al.*, (2016) [6] conducted to study with quality status on 40 seed samples of coriander in comparison to TL seeds with respect to germination, field emergence and seed health. Among seed treating chemicals, Carbendazim recorded maximum germination (72%), field emergence (61%) and yield (90.5g green plant/m2), SVI-I (1366) and SVI-II (144).

Seedling length (cm)

The data revealed on the seedling length it is evident from the table 1 ranged from 16.15 cm to 22.62 cm with mean value of 19.93 in which maximum seedling length (22.62 cm) was recorded in T_5. Ramesh Kumar Bhardwaj *et al.*, (2012) [12] assess to know the nature and magnitude of association among yield and different seed characters on thirty diverse genotypes of cucumber collected from different indigenous sources in which seed germination, dry seedling weight, seedling length, seed vigor index-I and seed vigor index-II is reliable for yield improvement in cucumber.

Seedling vigour index (SVI)

The data revealed on the seedling vigour index it is evident from the table 1 ranged from 1351.22 to 2096.11 with mean value of 1764.38 in which maximum seedling vigour index (2096.11) was recorded in T_5. C. K. Pramila *et al.*, (2013) [4] revealed that highest seed germination (89.42%) was recorded in fenugreek followed by fennel (76.82%) and lowest (64.33%) in coriander. The seedling vigour index was highest in fenugreek (range 1116-1819; mean 1532) and lowest in cumin (ranges 621-832; mean 737). A 12.0% increase in germination and improvement in the vigour index (997-1226) were also noticed in treated seed samples compared to control (900). R. K. Panda *et al.*, (2018) [10] conducted the impact of integrated nutrient management on production of quality

seeds in cowpea in which the data showed that the highest vigour index-1 and vigour index-II was recorded in T_7 (3590.50) and T_7 (19.30) respectively. T_5 and T_{10} recorded maximum germination percentage of 91.0 % followed by 90.33 % in T_7 and 87.67 in T_4. Maximum seedling length was observed in T8 which was 39.83 cm followed by 39.73 cm in T_7.

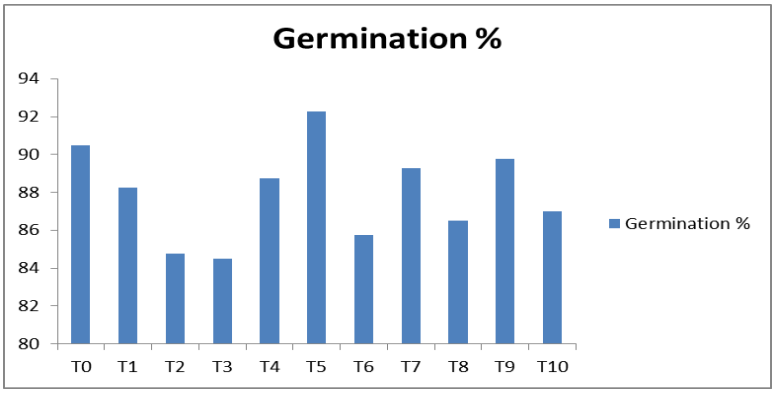

Fig 1: Histogram depicting germination percentage due the effect of treatment

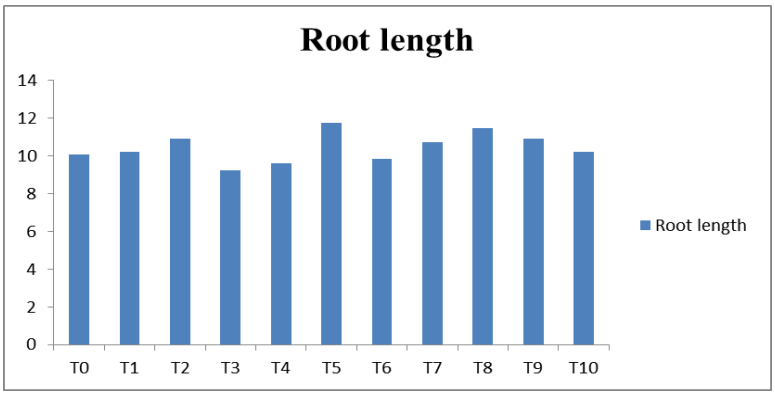

Fig 2: Histogram depicting Root length due the effect of treatment

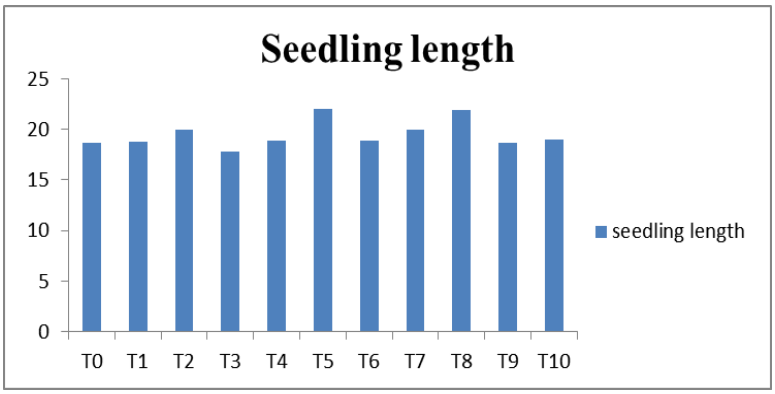

Fig 3: Histogram depicting Seedling length due the effect of treatment

Table 1: Mean performance of laboratory characters of field pea

Treatment	Germination %	Root length (cm)	Shoot length (cm)	Seedling length (cm)	Seedling vigour index
T_0	90.5	10.1	8.53	18.63	1720.65
T_1	88.25	10.24	8.61	18.76	1644.43
T_2	84.75	10.91	9.31	20.01	1751.02
T_3	84.5	9.26	8.63	17.79	1523.89
T_4	88.75	9.63	9.34	18.93	1668.65
T_5	92.25	11.74	10.43	22.06	2039.24
T_6	85.75	9.87	9.15	18.93	1623.18
T_7	89.27	10.75	9.12	19.97	1779.76
T_8	86.5	11.47	10.48	21.93	1924.77
T_9	89.75	10.94	9.57	18.69	1663.97
T_{10}	87	10.2	8.71	18.99	1662.65
Grand mean	87.93	10.46	9.26	19.52	1727.47
SEM	1.08	0.27	0.37	0.64	59.96
CD 5%	3.12	0.77	1.08	1.84	173.14

Conclusion

It is concluded from the present investigation that treatment T_5 (100% RDF + Rhizobium@20g/kg seed) exhibited higher mean value for seed germination percentage, Root length, Shoot length, Seedling length and Seedling Vigour Index followed by T_3 with respect of Germination percentage, T_0 with respect of Root length, Shoot length and Seedling length, T_6 with respect of Seedling Vigour Index. Thus, it indicates that the above findings of results of the study clearly indicated the combination of chemical fertilizers and biofertilizers were significant on increase the seed quality parameters of field pea.

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References

1. Almansouri M, Kinet JM, Lutts S. Effect of salt and osmotic stresses on germination in durum wheat (*Triticum durum*). Plant and Soil, 2001, 243-254.
2. Ashwani Kumar, Pandita VK. Effect of integrated nutrient management on seed yield and quality in cowpea. Legume Research. 2016; 39(3):448-452.
3. ASPB. Regulations on the sale of planting seed in Arkansas. Arkansas state plant board, Box 1069, little rock, Arkansas-72203, 2003.
4. Pramila CK, Prasanna KPR, Balakrishna P, Devaraju PJ, Siddaraju. Assessment of seed quality in seed spices. Journal of Spices and Aromatic Crops. 2013; 22(2):233-237.
5. Deshpande VK, Kurdikeri MB, Shakuntala NM. Effect of seed hardening with organics on seed quality of Bengal gram. Karnataka Journal of Agriculture Science. 2008; 21(1):118-119.
6. Beura JK, Priyadarsini A, Tarai RK, Kar AK, Swain SK. Effect of Seed Treatment on Seed Quality Enhancement in Coriander. An international Quarterly Journal of Life Sciences. 2016; 11(1):579-582.
7. Mahajan A, Sharma R. Integrated nutrient management (INM) system- Concept, Need and Future strategy. Agrobios Newsletter. 2005; 4(3):29-32.
8. Mishra A, Dayal A. Effect of Organic and Inorganic Fertilizers on Seed Quality of Different Varieties of Chilli (*Capsicum annum* L.). Natural Products Chemistry Research. 2018; 6:326.
9. Palaniappan SP, Annadurai K. Organic Farming: Theory and Practices. Scientific Publishers, Jodhpur, India, 2007, 169.
10. Panda RK, Sahu GS, Dash SK, Muduli KC, Pradhan SR, Nahak SC. Impact of Integrated Nutrient Management on Seed Quality Parameters of Cowpea [*Vigna unguiculata* L.]. International Journal of Pure and Applied Bioscience. 2018; 6(6):687-691.
11. Raj Kumar Suman, Kamal Kant, Surya Prakash Meena, Vijay Dugeasr. Evaluation of Seed Quality Parameters in Coriander (*Coriandrum sativum* L). International Journal of Current Microbiology and Applied Sciences. 2018; 7(07):368-373.
12. Ramesh Kumar Bhardwaj, Sandeep Kumar. Studies on correlation between yield and seed characters in cucumber (*Cucumis sativus* L.). International Journal of Farm Sciences. 2014; 2(1):54-58.
13. Schatz B, Endres G. Pea production North Dakota State University. Fargo, USA, 2009.
14. Sidhawani SK. Use of certified seeds and its contribution towards productivity. In seminar seed industry in Haryana, 1991, 12-13.
15. Thompson PA. Seed germination in relation to ecological and geographical distribution. Taxonomy and ecology. Academic Press, London, UK, 1973, 93-119.
16. Yakkala Siva Sankar, Niranjani Chaurasia, Chaurasia AK, Arvind Kumar, Rai PK. Studies on Seed Quality Parameter of Okra (*Abelmoschus esculentus* L.). International Journal of Emerging Technology and Advanced Engineering. 2015; 7(5):513-517.
17. Abdul-Baki AA, Anderson JD. Vigour and leaching of water soluble sugars from seeds of their species during storage under controlled conditions. Seed Research. 1973; 1:99-114.
18. Fiala F. Handbook of Vigour Test Methods. International Seed Testing Association Publication, 1987.
19. Fritz T. Germination and vigour test of cereals seed. Proceedings of the ISTA, 1965, 923-927.