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Impact of Integrated Nutrient Management on Seed Quality Parameters of Cowpea [*Vigna unguiculata* L.]

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ABSTRACT

An experiment with the aim of analyzing the impact of integrated nutrient management on production of quality seeds in cowpea was conducted with treatments T1 (RDF), T2 (RDF + lime), T3 (75% RDF + lime), T4 (75% RDF +25% FYM), T5 (75% RDF +25% vermicompost), T6 (75% RDF+25% FYM + lime), T7 (75% RDF + 25 % vermicompost + lime), T8 (50% RDF + 25% FYM+ 2 foliar spray), T9 (50 % RDF + 25% vermicompost +2 foliar spray), T10 (50% RDF +25% FYM + lime + 2 foliar spray), T11 (50% RDF +25% vermicompost + lime+ 2 foliar spray) and three replications in Bhubaneswar, Odisha. Observations on seed quality parameters like vigour index, germination percentage and seedling dry weight were taken and conclusion were made. As per the observations, the highest vigour index-1 and vigour index-II was recorded in T7 (3590.50) and T7 (19.30) respectively. Treatment T3 recorded maximum 100-seed weight of 13.0 g followed by 12.67g in T7. T5 and T10 recorded maximum germination percentage of 91.0 % followed by 90.33 % in T7 and 87.67 in T4. Maximum seedling length was observed in T8 which was 39.83 cm followed by 39.73 cm in T7.

Key words: *Vermicompost, Germination, Cowpea, Nutrient*

INTRODUCTION

Cowpea (*Vigna unguiculate* L.) is one of the most important legume vegetable cultivated in Odisha round the year. There is a worldwide consensus that sole dependence on chemical input based agriculture is not suitable in long run and only integrated plant nutrient systems (IPNS) involving a combination of fertilizer, organic manure and biofertilizers are essential to sustain crop production, preserve soil health and biodiversity. In addition to this, organic manure helps in improving the use efficiency of inorganic fertilizers. Use of organics alone does not result in spectacular increase in crop yields due to their low nutrient status[9]. Therefore, the aforesaid consequences have varied way to grow cowpea using organic and inorganic fertilizer along with biofertilizers.

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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. 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.

Quality seed production in cowpea and seed availability is a felt need among the farmers. In view of such circumstances systemic research efforts are to be integrated to find out an optimum combination of organic nutrients *viz.,* FYM, vermicompost, lime with different doses of chemical inorganic fertilizers in cowpea under coastal agroclimatic zones of Odisha to standardize a best combination to get high quality seed.

In view of the above facts the present investigation was undertaken to study the impact of some of the ways and combinations of nutrient management strategies to enhance quality seed production in cowpea [*Vigna unguiculata* L.] to assess their effect on quality parameters of seed.

MATERIAL AND METHODS

The field experiment was carried out during Rabi season of the year 2016-17 in the Vegetable Demonstration Plot of the Department of Vegetable Science, College of Agriculture, Orissa University of Agriculture and Technology, Bhubaneswar, Odisha. The trial was conducted in RBD with three replications and eleven treatments. The treatments are T1 (RDF), T2 (RDF + lime), T3 (75% RDF + lime), T4 (75% RDF +25% FYM), T5 (75% RDF +25% vermicompost), T6 (75% RDF+25% FYM + lime), T7 (75% RDF + 25 % vermicompost + lime), T8 (50% RDF + 25% FYM+ 2 foliar spray), T9 (50 % RDF + 25% vermicompost +2 foliar spray), T10 (50% RDF +25% FYM + lime + 2 foliar spray), T11 (50% RDF +25% vermicompost + lime+ 2 foliar spray). [Recommended Dose of Fertilizer i.e. 40: 60: 60 kg NPK ha^{-1}, lime @ 5q/ha was applied. Calculated amount of FYM and vermicompost were applied as per treatments. Foliar spray with NPK (19-19-19) @ 7.5 g/l was done as per the treatment.]

The seed of cowpea variety Kashi Kanchan, was collected from IVRI, Varanasi. Kashi Kanchan is a promising cow pea variety released from IIVR, Varanasi. This verity can be grown round the year provided there is mild winter during December and January. This variety is bushy and do not require staking with profuse fruiting. Good, healthy and bold seeds were selected and sowing was done after land preparation of the main field on lines giving 50 cm × 20 cm spacing in each plot of 3 m × 2.5m length and width.

Decomposed compost, well sieved vermicompost were purchased and applied in time as per treatment. FYM and vermicompost were applied before sowing of seeds. The recommended dose of fertilizer is 40:60:60 kg NPK ha^{-1} was applied through Urea, SSP (Single Super Phosphate) and MOP (Muriate of potash). The total amount of phosphorous and half of nitrogen as well as half of potash were applied as basal dressing before sowing the seeds in the rows. Thirty days after sowing, half of nitrogen and half of potash was applied as top dressing during hoeing, as per the treatment schedule. The soluble fertilizer (19:19:19 N: P: K) was sprayed as per the treatment schedule. All other recommended package of practices were followed throughout the research work. From each treatment ten number plants selected randomly were tagged for recording various biometric observations. The mean of the ten plants was considered for further analysis. The observations on various growth and yield parameters were recorded from the selected plants. The border plants were excluded while selecting the sample plants.

From each treatment ten number plants selected randomly were tagged for recording various biometric observations. The mean of the ten plants was considered for further analysis. The observations on various quality parameters were recorded from the selected plants. The border plants were

excluded while selecting the sample plants. Quality parameters like hundred seed weight (weight of 100 matured, dry seeds recorded in gram), germination percentage (determined by the standard germination test using between paper towel method in the laboratory), seedling length (after paper towel method to determine germination percentage, the length of the seedlings were measured and expressed in cm), seedling dry weight (hot air oven dried weight of the seedling expressed in mg), seedling vigour index-I (seedling vigour index - I= germination% x seedling length, seedling vigour index-II (seedling vigour index - II= germination % x seedling dry weight) were recorded by taking observations from different treatments.

Analysis of variance (ANOVA) was carried out on mean values separately for each character adopting standard analysis of variance technique for RBD design[3]. The analysis of variance for each of the character was carried out with the mean value of data collected from sample plants from each plot and the mean average data was used for the total variance into components due to replication, treatment and error.

RESULTS AND DISCUSSIONS

Treatment T3 recorded maximum 100-seed weight of 13.0 g followed by 12.67g in T7, T6, T4 and T10. The lowest 100-seed weight was observed in T5 recording values of 11.33 g and 11.67 g in T9 respectively. There was no significant difference found for this character among the treatments (Table 1). Whereas, T5 and T10 recorded maximum germination percentage of 91.0 % followed by 90.33 % in T7 and 87.67 in T4. The lowest germination percentage was recorded in T1 (81.33 %) and 80.67% in T8 (Table 1). Maximum seedling length was observed in T8 which was 39.83 cm followed by 39.73 cm in T7, 33.97 cm in T9 and 33.8 cm in T2. Seedling with shortest length was observed in 28.37 cm T4 and 29.50 cm in T11. There was significant difference among the treatments for length of seedling observed during the experiment (Table 1). The seedling dry weight value was maximum i.e. 214.33 mg in T8 followed by 213.67 mg in T7, 189.0 mg in T2 and 183.67 g in T9. The treatment with lowest seedling dry weight was 150.67 mg in T1and 168.33 mg in T4. T7 and T8were significantly superior than other treatment.

Table 1: Seed quality parameters as influenced by different treatments

Treatment		100-seed weight (g)	Germination (%)	Seedling length (cm)	Seedling dry weight (mg)	Vigour index-I	Vigour index-II
T_1	RDF	12.33	81.33 (9.01)	29.87	2433.56	12.24	150.67
T_2	RDF + lime	12.33	82.00 (9.05)	33.80	2745.26	15.49	189.00
T_3	75% RDF + lime	13.00	86.00 (9.27)	30.73	2644.80	15.25	177.33
T_4	75% RDF + 25% FYM	12.67	87.67 (9.36)	28.37	2488.36	14.75	168.33
T_5	75% RDF+25% vermicompost	11.33	91.00 (9.53)	29.57	2691.86	15.47	170.00
T_6	75% RDF + 25% FYM + lime	12.67	86.67 (9.30)	32.60	2826.80	13.55	156.33
T_7	75% RDF +25% vermicompost + lime	12.67	90.33 (9.47)	39.73	3590.50	19.30	213.67
T_8	50% RDF + 25% FYM + 2 foliar spray	12.36	80.67 (8.97)	39.83	3216.23	17.28	214.33
T_9	50% RDF + 25% vermicompost + 2 foliar spray	11.67	84.33 (9.16)	33.97	2871.85	15.52	183.67
T_{10}	50% RDF + 25% FYM + lime + 2 foliar spray	12.67	91.00 (9.51)	30.87	2808.63	15.74	173.00
T_{11}	50% RDF +25% vermicompost + lime + 2 foliar spray	12.00	84.00 (9.16)	29.50	2450.60	14.30	170.33
	CEm (±)	0.48	2.56 (0.14)	0.66	127.74	0.48	1.90
	CD (0.05)	1.41	7.55 (0.40)	1.96	364.99	1.40	5.61
	CV (%)	6.72	5.16 (2.54)	3.52	7.66	5.38	1.84

Among the treatment in T7 higher Vigor index-I **(**Germination % x seedling length**)** of 3590.50 followed by 3216.23 in T8 and 2871.85 in T9. The lowest Vigour index-I was observed in T1 with a value of 2433.56. But it was 2450.66 in T11 and 2488.36 in T4 (Table 2). Vigour index II **(**Germination % x seedling dry weight**)** was observed to be maximum i.e. 19.30 in T7 followed by 17.28 in T8 15.74 in T10. The lowest Vigor index - II of value 12.24 was observed in T1 but it was 13.55 in T6, 14.3 in T11. T7 was found to be the best treatment with significantly superior Vigour index-2 than all other treatments (Table 2).

The hundred-seed weight ranged from 11.67 to 13.00 gram in different treatment. There was no significant effect of different treatment on 100 seed weight. The findings of Singh *et al.*[7], Sharma *et al.*[6], Singh and Chauhan[8], Raman *et al.*[5], Raman *et al.*[4] and Bhathal and Kumar[1] also corroborate with the present findings.

The freshly harvested seed were allowed to germinate in the laboratory between the paper and it was found that the germination percentage varied from 80.67 in T8 to 91.00 in T_5. It was observed that in most of the cases the germination percentage was higher and was more than 80%. However, in most of the cases there was so significant difference in percentage of germination which indicates that all the treatments did not produced significant effect on germination of seeds. Similar result were also recorded by Kumar and Pandita[2] in cowpea.

The germinated seedling length was recorded and was observed that it varied from 28.37 in T_4 to 39.97 in T_8. Similarly, the dry weight of germinated seedling recorded highest weight of 214.33(mg) in T_8 and lowest 150.67 mg in T_1. Similarly, the vigour index 1 was found to be highest in T_7 (3590.50) and was lowest in T_1 (2433.56). There was significant difference in vigour index-1 in most of the treatment. The vigour index -II varied between 12.24 in T1 to 19.30 in T_7. It was found that so far as study of quality parameters of seed was observed T_7 (RDF 75% + 25% Vermicompost + Lime) recorded best results for most of the parameters which may be due to effect of Vermicompost along with 75% RDF and lime. Few treatments where only RDF was taken or 75% RDF with lime was taken the trend was different. This type of findings was also observed and reported by Kumar and Pandita[2] in cowpea.

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