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UPGRADATION OF COWPEA SEED PRODUCTION AND GERMINATION ALLIED ÁLPHA - AMYLASE THROUGH SEED TREATMENT OF COW-EXCRETA

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ABSTRACT
The experiment was laid out in field to evaluate the effect of cow excreta as seed treatment on qualitative and quantitative seed parameters of Cowpea (*Vigna unguiculata* L.) cv. Bundel-2 under seed production during 2013-14 and 2014-15. Crop achieved significant upgradation over control in different field parameters considerable at seed production system with high up in activities of some bio-molecules particularly á-amylase (μg $min^{-1}g^{-1}$) at 24 hours phase of imbibition. The treatments T_9 (2% cow dung solution + 75% cow urine) followed by T_5 (2% cow dung solution) specified peak performance with an exception in pod number and seed weight only. The non-significant nature in mean value of year and interaction of treatment-year legitimate the observation. In correlation matrix, the diverse parameters specified a positive significant correlation excluding seed yield pod^{-1} only. Hence, the specific recipe of cow-excreta (T_9) was encouraging for inventiveness of qualitative parameters liable to seed production of cowpea.

INTRODUCTION

Cowpea (*Vigna unguiculata* L.) is one of the important seasonal pulses grown in India. Due to its high potentiality as food, feed or fodder items, it has an enormous scope to improve its quantitative and quantitative upgradation of the ultimate produce *i.e.* seed. But the sound awareness or adoptions are not sustained to the growers for its cultivation precisely in seed production though it is one of the basic inputs in any crop cultivation system. Farmers consider its cultivation as an unusual crop even the choice location endures its cultivation as neglected crop of fallow land that is one of the vital cause of qualitative and quantitative deterioration predominantly in seed production.

In application of diverse treatments preferably in seed priming procedure, the legume seed can be exposed its optimum potentiality by enhancing the quality and uniformity of seedling at field emergence. The natural product, cow excreta, is used to put emphasis on the cultivation system as a general stimulator to upscale the plant and surrounding soil. Cow excreta have a potential role to persuade seed production potential (Menon *et al.*, 2010) through enhancement of seedling quality under varied approaches of application. The basic target of seed production system is the quality seed which is maintained through nature of crop growth initiating from the day of seed germination to its plant formation ongoing to development of seed. The crop cultivation is severely affected through qualitative and quantitative degradation of seed in occurrence of developmental variation at pre-harvest stage. To ensure the ideal production system, the exposer and exploitation of seed quality is practical phenomenon. The application of chemical fertilizers undoubtedly shows immediate results, but in long-run gives to soil deterioration, environmental pollution and health hazards. In contrast to inorganic fertilizer, the organic manure acting a vivacious role to bring stability and sustainability to agriculture (Anitha *et al.*, 2015) and also to avoid over confidence on chemical fertilizers. Moreover, the quality assurance in seed production has a pivotal role that may be the induced in organic system of cultivation. At present, the preference of consumer is more in organically produced materials as their low or free toxic residues and environment friendly nature (Yoganathan *et al.*, 2013).

In present study, the intensification of seed production was highlighted on crop cowpea where crop growth and seed maturity were very much affected due to poor seed standard and field standard that may be minimized in the way of seed treatment after allowing the diverse uses of cow excreta. The diverse manners of cow excreta may pick up the production level (Sahu and Kumar, 2017) in addition to strengthening the seed quality parameters of cowpea. The enhanced productivity along with superior seed quality of cowpea seed in a cost effective way is the prime motto of this study.

MATERIALS AND METHODS

The field assessment was conducted in Instructional Farm, BCKV, Mohanpur, West Bengal considering *Rabi* season of 2013-14 and 2014-15.The experiment was done on crop Cowpea cv. Bundel-2 through application of varied

combinations of extracts of cow dung and cow urine as priming treatments (symbolized as T_0 to T_9) produced from the base solution of cow excreta with control. Different doses of treatment were T_0 as control (100 % water), T_1 as 50 % cow urine, T_2 as 75 % cow urine, T_3 as 100 % cow urine, T_4 as 1% cow dung solution, T_5 as 2% cow dung solution, T_6 as 4% cow dung solution, T_7 as 4 % cow dung solution + 50 % cow urine, T_8 as 1 % cow dung solution + 100 % cow urine, T_9 as 2 % Cow dung solution + 75 % cow urine.

The base solution of cow-excreta was set (Mandal and Chakraborti, 2017) in the following way.
Fresh Cow urine was preserved for 3 days at 25ºC which was utilized as base solution for making varied concentrations.
Fresh 5g cow dung (raw) was added to water in the ratio of 1:1 that was conserved as previous way (i.e. 3 days at 25°C). The blend was centrifuged for 5 minutes at 10,000 rpm and supernatant was used as base solution for unlike treatments.

Each set of treatment was executed for seed soaking of 12 hours at 25°C and these were air dried to sustain earlier seed moisture. The treated (primed) seeds were planted in designed field plots for qualitative and quantitative assessment through SPSS (version 10.0, 1990) software.

RESULTS AND DISCUSSION

To upgrade seed production, the yield linked seed parameters were considered for study. The variability of different treatments in significant manner represented the encouraging role of productivity as well as quality for successful seed production practice. Present study legitimately established the outline demonstrating on field parameters with biochemical action at germination stage. The table 1 was representing the mean values of these.

The parameters contributing to seed yield showed non-significant demarcation in respect to year though an exemption was observed in alpha-amylase activity. But these parameters showed significant variation in application of various treatments specifically over control. The treatments, T_9 followed by T_4 were maintaining the superiority in mean values of treatment with special emphasis to yield of seed or pod.

Significant deviation among diverse treatment effects pursued more or less equal pattern in influence of different yield attributes allied to seed quality like number of pods plant^{-1}, seeds pod^{-1}, pod yield plant^{-1}, seed yield plant^{-1}. The topmost outcome was specified in T_9 followed by T_4 and T_5 concerning to non-significant relationship within them. The next important character, 100 seed weight followed topmost activity in use of T_8closely allied toT_9 and T_5 though certain treatments were also influential precisely for the character. The yield concerning parameter, seed weight pod^{-1} showed topmost influence in application of T_3 and T_6 though the effects of T_8, T_9 and T_7 showed good prominence with a non-significant demarcation

Table 1: Observation on various treatments effect considering field parameters and bio-molecular activities

Treatments	pods plant^{-1}	Pod yield plant^{-1} (g)	seeds pod^{-1}	Seed weight pod^{-1} (g)	100 seed weight (g)	Soluble Protein (mg g^{-1})	α-amylase(24 hours) (μg min^{-1} g^{-1})	Seed yield plant^{-1} (g)
T_0	17.77	25.92	11.21	1.01	9.04	34.25	55.34	13.59
T_1	18.84	25.63	10.56	0.95	9.68	33.79	55.56	14.96
T_2	19.76	25.09	11.68	1.01	9.79	39.02	57.26	15.52
T_3	18.11	27.50	11.82	1.19	9.98	35.85	57.13	15.88
T_4	23.82	32.82	11.97	1.11	10.07	41.86	57.27	19.89
T_5	23.00	32.53	12.96	1.14	10.18	45.89	58.79	20.61
T_6	21.15	29.24	11.85	1.19	10.08	37.86	56.74	18.58
T_7	21.70	31.15	11.78	1.16	9.90	38.79	57.94	19.00
T_8	21.51	30.70	12.62	1.18	10.21	41.05	59.59	19.57
T_9	24.10	32.96	12.98	1.16	10.16	45.68	60.85	21.41

	SE(m) ±	LSD (0.05)	SE(m) ±	LSD (0.05)	SE(m) ±	LSD (0.05)	SE(m) ±	LSD (0.05)	SE(m) ±	LSD (0.05)	SE(m) ±	LSD (0.01)	SE(m) ±	LSD (0.01)	SE(m) ±	LSD (0.05)
Y	0.265	NS	0.205	NS	0.127	NS	0.009	NS	0.058	NS	0.340	NS	0.293	1.122	0.339	NS
T	0.592	1.696	0.458	1.312	0.283	0.810	0.020	0.057	0.131	0.374	0.760	2.908	0.656	0.509	0.759	2.173
Y×T	0.838	NS	0.648	NS	0.400	NS	0.028	NS	0.185	NS	1.075	NS	0.928	NS	1.073	NS

Table 2: Correlation matrix related to yield parameters, soluble protein and alpha amylase

	pods plant^{-1} plant^{-1} (g)	Pod yield	seeds pod^{-1} pod^{-1} (g)	Seed weight weight (g)	100 seed (24 hours)	Soluble Protein (24 hours) (mg g^{-1})	α-amylase (μg min^{-1} g^{-1})
Pod yield plant^{-1} (g)	0.840**						
seeds pod^{-1}	0.467**	0.535**					
Seed weight pod^{-1} (g)	0.151NS	0.366**	0.380**				
100 seed weight (g)	0.478**	0.560**	0.317*	-0.002NS			
Soluble Protein (24 hours) (mg g^{-1})	0.736**	0.731**	0.607**	0.128NS	0.368**		
á-amylase(24 hours) (μg min^{-1} g^{-1})	0.560**	0.582**	0.552**	0.254NS	0.586**	0.498**	
Seed yield plant^{-1} (g)	0.826**	0.769**	0.464**	0.401**	0.201NS	0.751**	0.450**

NS - Non-significant

with the former. The pod and seed simultaneously contributed in progress of productivity through cumulative number and weight though internal quality of seed can be judged in reformed way.

The seed size, specific gravity, exact seed weight, assured higher seed vigour as well as quality that was more functioning in observation of seedling or biochemical analysis (Mandal and Chakraborti, 2017). The soluble protein and activity of alpha amylase at initiation of germination was most valued observation (Menon *et al*., 2010) for early emergence, uniformity and stable healthy nature in conversion from seed to seedling. The treatment mean values indicated the nature of soluble protein where highest value was found in T_5 afterwards T_9 in a non-significant demarcation. The significant distinct variation was existed for other treatments highlighting go up over control. The identical treatments illustrated the extreme activity of α-amylase in T_9 with non-significant demarcation to T_8. The treatment mean effects showed significant variation in most cases though certain treatments recorded higher value for these characters expressing non-significant approach within them.

Two years effect displayed non-significant pattern in mean values with only exception in alpha-amylase activity. The observations on first year showed highest effect for most of the parameters with non-significant or significant mode. The equivalent nature in two years indicated the specific effect of treatments comparing to control. In interaction values of year and treatment indicated non-significant variation. The association among diverse field parameters, biochemical activity was presented in table 2. The different traits indicated a strong positive correlation within them though non-significant relation was observed in seed weight pod^{-1} with maximum parameters irrespective of negative and positive indication. The seed yield specified strong positive significant correlation for all parameters which should be dependent on selection pressure of primary field parameters of pod and seed in addition to germination linked enzyme.

The negligible effect of control (T_0) observed in various field parameters that may be related to poor seedling growth at period of germination. The internal physiological activity systematized the germination activity not only to increase its percent, where seedling strength may be encouraging to produce good plant systemized the optimal plant growth, precise assimilation of nutrients and reasonable partitioning of photosynthates.

A number of researchers had worked on several crops especially in cowpea and soybean seed with other cereals like wheat for revealing the consequence of cow excreta in diverse mode (Oliveira *et al*., 2002, and Shwetha *et al*., 2009).

The seed treatment of cow excreta may exhibited its action as plant growth regulator through enhancement of seedling, plant, photosynthetic efficiency, transpiration rate, relieved the adverse effect of water stress (El-Tanahy *et al*., 2012), and also to control the lodging. Treatments considering animal manures showed significant result which increases the grain yield, HI, kernel weight, kernels $spike^{-1}$ *etc*. accumulating greater nutritional value, economic yield and recovered seed quality in vegetable cowpea (Shahardeen *et al*., 2013). Vijaya kumari *et al*.(2012) showed different cow products like Panchagavya as seed treatment for seed fortification. Plant growth regulating activity slightly increased the magnesium (Mg) content in seed (Wierzbowska, 2006) that may be better in application of cow products.

The ideal progress in vegetative stage can persuade proper accumulation of dry matter at reproductive period from source to sink. The objective in crop physiology is qualitative seed yield that can be augmented through more efficient use of photosynthates or more can be gained by successful net photosynthate supply (Wardlaw, 1980). The amplified enzymatic action at seed germination may favour through good establishment of seedling.

Considering the treatments, T_9 (2 % cow dung solution, 75 % cow urine) and T_5 (2 % cow dung solution) showed topmost effect though T_8 (1 % cow dung solution, T4 + 100 % cow urine,) T_4 (1 % cow dung solution) were good only a few cases. (Islam *et al*., 2010 and Rajesh *et al*., 2013) recommended that various combination of cow excreta improved the amino acid content, protein, carotenoid, chlorophyll *etc*. at crop produce responsible as enhancer of seed quality. The microbial action in cow excreta especially cow dung may activate various enzymes supportive to seed vigour. The correlation study evidently specified the positive role of α-amylase in nature of seed germination. The enrichment in content of protein and interrelated RNA may regulate the process of germination essential to elongate cell structure or cell divisions (Mandal *et al*., 2013) where best response was authenticated in specific combinations T_5 (2 % cow dung solution), T_9 (2 % cow dung solution 75 % cow urine), may be considerable as leading technique for seed production scheme of Cowpea.

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