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EFFECT OF BEEJAMRUTHA ON SEED GERMINATION, VIGOUR AND ENZYME ACTIVITY IN BLACKGRAM SEEDS

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ABSTRACT

The experiment was carried out at Dept. Of Crop Physiology, S.V. Agricultural College, Tirupati in a complete randomised design with three seed treatments *viz.,* seed soaked in beejamrutha, water and a control (without seed soaking). The results revealed that beejamrutha seed treatment recorded higher germination per cent (96%), seedling vigour index (654.64) and amylase enzyme activity (3.88) compared to seed soaked in water and control. However, the coefficient of velocity of germination was recorded higher with the seed soaked in water (31.21) compared to beejamrutha seed treatment (24.88).

KEY WORDS: Blackgram, beejamrutha, CVG, amylase, germination per cent

INTRODUCTION:

Pulses play an important role in Indian agriculture for sustainable production, improvement in soil health and environment safety. India is the largest producer and consumer of pulses in the world. Pulses are considered to be the cheaper source of protein to overcome malnutrition among human beings. In India, blackgram is grown in an area of 761.3 thousands of hectares, with a production of 678.6 thousand tonnes and with a productivity of 891.0 kg ha^{-1}. While in Andhra Pradesh, it covers an area of 296 thousands of hectares, with a production of 277 thousands of tonnes and with a productivity of 936 kg ha^{-1}(Indiastat, 2018).

Pulses contain high percentage of quality protein nearly three times as much as cereals (Umadevi and Ganesan, 2007). Among them, blackgram (*Vigna mungo* L.) is one of the most widely grown grain legumes and belongs to the family fabaceae and assumes considerable importance from the point of food and nutritional security. It is an annual herbaceous plant consumed in the form of 'dal'. Also used as a nutritive fodder for milch cattle. Blackgram is rich in its nutritive value with 24 per cent Protein and richest source of phosphoric acid among pulses. (Singh, 2009).

Among indigenous technologies used by farmers, use of beejamrutha has been given importance since age old days. Beejamrutha, a mix of cow dung, cow urine, water, lime and a handful of soil, a totally organic product helpful for the plant growth and protects the crop from harmful soil-borne and seed-borne pathogens. Smearing the seeds with beejamrutha before sowing control many diseases that attack the plant right from its seedling stage. (Sreenivasa *et al.,* 2009). Presence of naturally occurring beneficial microorganisms predominantly bacteria, yeast, actinomycetes, photosynthetic bacteria and certain fungi were detected in cow dung (Swaminathan, 2005) which is one component of beejamrutha.

MATERIALS AND METHODS

Preparation of beejamrutha:

Beejamrutha was prepared using cow dung, cow urine, water and lime. Cow dung (5 kg) tied in a cloth was dipped in a bucket containing 50 litres of water overnight. To the resultant liquid, five litres of cow urine, a handful of soil and 50g of calcium chloride was added to make the final product.

Seed germination per cent:

The total number of seeds germinated to the total number of seeds placed in Petri plate were counted to get the seed germination per cent at seven days after experiment.

$$\text{Seed germination per cent} = \frac{\text{No. of seeds germinated}}{\text{Total no. of seeds in Petri plate}} \times 100$$

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Root length:

Root length was measured using a standard scale from the base of the root to the tip of the root at seven days after experiment and is expressed in centimetres.

Shoot length:

Shoot length was measured from the base of the shoot to tip of the seedling at seven days after experiment and is expressed in centimetres.

Seedling vigour index:

Seedling vigour index was calculated by using the following formula suggested by Abdul-baki and Anderson. (1973)

Seedling Vigour index = (Shoot length + Root length) X Germination percentage

Coefficient of velocity of germination:

The coefficient of velocity of germination was calculated by adopting the formula suggested by Kotowski. (1962)

$$CVG = \frac{N_1 + N_2 + \ldots\ldots\ldots N_K}{N_1T_1 + N_2T_{2+} \ldots\ldots\ldots\ldots N_KT_K} X\ 100$$

Where,

'N' is the number of germinating seeds within the consecutive intervals of time 'T' and 'T' is the time between beginning of the test and the end of the particular intervals of measurement.

Amylase (mg g^{-1}) activity

The enzyme activity was estimated at 48hour of germination. The blackgram seed sample (2g) was grinded in a mortar with cold 0.1M phosphate buffer of pH 6.7 and finally crushed into paste using a homogenizer. The temperature was maintained at 4^{O} C by putting ice in the outer chamber of the homogenizer. The suspension was then filtered through few layers of cheese cloth in the cold room. The filtrate was collected and clarified further by centrifugation in a refrigerated centrifuge at 10,000 rpm for 15 min at 4^{O} C. Amylase activity was assayed by the method as described by Jayaraman, 1981. One per cent starch solution was used as substrate (1 g in 100 ml of 0.1M phosphate buffer, pH 6.7). The amylase activity was measured by estimating the release of maltose calculated from the standard curve prepared with maltose. One unit of amylase activity was defined as the amount required for liberating 1 mg of maltose in 15 min at 37^{O} C.

RESULTS AND DISCUSSION:

Germination percentage (%)

Among the treatments, seed treated with beejamrutha has recorded higher germination percentage (96%) compared to water soaking (94%) and control (84%). Higher germination percentage with the beejamrutha seed treatment might be due to the presence of useful bacteria in beejamrutha, producing indole acetic acid (IAA) and gibberellic acid (GA) (Sreenivasa *et al.,* 2009). Similar results were also recorded by Shakuntala *et al.* (2012) in paddy.

Root length (cm)

Root length of the seedling differed significantly with different seed treatments. Seed soaked in water has recorded numerically higher root length (1.73 cm) which is on par with the seed treated with beejamrutha (T_1) which recorded a root length of 1.91cm. Whereas, control recorded lowest root length (1.39cm) compared to other treatments.

Shoot length (cm)

Similar to germination percentage, shoot length was significantly higher in the seeds treated with beejamrutha (5.09 cm) compared to water soaking and control. This may be due to the production of IAA and GA by the bacteria present in beejamrutha which could have stimulated seedling length compared to untreated control. Similar results were also reported by Sreenivasa *et al.* (2009) in soybean.

Seedling Vigour index

A significantly higher seedling vigour index was reported in the treatment of seed treated with beejamrutha (654.64). The increase in seedling vigour index is due to

the higher germination per cent and higher shoot length in the seed treatment with beejamrutha. While, control recorded significantly lower seedling vigor index. Shakuntala *et al.* (2012) also reported a significantly higher seedling vigour index in the seed treated with beejamrutha.

Coefficient of velocity of germination (CVG)

CVG is one of the vigour parameters to evaluate initial seed germinating vigour, which reflect on initial field emergence in terms of emergence index. A significant difference among the treatments was observed in CVG of blackgram. The results revealed that CVG was recorded significantly higher with the seed soaked in water for 30 mins (31.21). The obtained results are due to the increased speed of germination in the seeds soaked in water compared to beejamrutha seed treatment and control.

Amylase enzyme activity (mg g^{-1})

Amylases are important hydrolytic enzymes which triggers after seed imbibitions and help in hydrolysing starch into sugars, which provide the energy for growth of roots and shoots. The activity of amylases during seed germination in mungbean was reported (Rahman *et al.,* 2007).

Amylase activity differed significantly among different seed treatments. Alpha amylase activity was significantly higher in the seeds treated with beejamrutha compared to control and seed soaked in water. This may be due to the production of GA by the bacteria present in beejamrutha which enhances the production of alpha amylase by denovo synthesis.

CONCLUSION:

Blackgram seed germination and vigour in terms of germination percentage, seedling vigour index, amylase enzyme activity were found significantly higher with the seed treatment beejamrutha compared to seed treatment with water and control due to presence of nutrients and growth hormones in beejamrutha.

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Table 1. Effect of Beejamruta seed treatment on seed germination, vigor and alpha amylase activity of blackgram seeds

Treatments	Germination percentage (%)	Root length (cm)	Shoot length (cm)	Seedling vigour index	CVG	Alpha amylase (mg g^{-1}) at 48 hrs of germination
T_1: Seed treated with Beejamrutha (100%)	96.00	1.73	5.09	654.64	24.88	3.88
T_2: Seed soaked in water for 30 minutes	94.00	1.91	4.35	589.24	31.21	3.12
T_3: Control (Without any seed treatment)	84.00	1.39	3.70	428.24	28.79	3.01
Mean	91.33	1.68	4.38	557.37	28.29	3.34
SE(m)	2.16	0.06	0.27	30.66	1.24	0.07
C.D.	7.15	0.21	0.90	101.53	4.09	0.23