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EFFECT OF BIJAMRITA AND OTHER ORGANIC LIQUIDS TREATMENTS ON SEED GERMINATION AND SEEDLING GROWTH OF RAJMA (*PHASEOLUS VULGARIS* L)

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ABSTRACT

A lab experiment was conducted to assess the effect of bijamrita and other organic liquid treatments on seed germination and seedling growth of rajma during *rabi 2024*. Treatments were seven with four replicates each *viz*. T_1- Bijamrita 25%, T_2-Bijamrita 50%, T_3- Bijamrita 75%, T_4-Bijamrita 100%, T_5-Local cow dung extract, T_6-Local cow urine, T_7-Control. The gemination parameters like seedling length, seedling weight and vigor parameters like seedling vigor index-I, seedling vigor index-II were calculated. Among the different concentration of bijamrita seed treatments, seed treatment with 100% bijamrita recorded highest geminating percent (97%), seedling length (26.39 cm), seedling fresh weight (1.61 g), seedling dry weight (0.26 g) and vigor parameters SVI (2561.27) and SVII (25.14). The total seedling length, fresh weight, dry weight was also increased when seeds were treated with organic liquid formulations. Hence Bijamrita is recommended for the farmers to use in agriculture. This regular seed treatment will reduce dependence on use of chemicals and subsequently reduces pollution caused by chemical treatments.

***Keywords*:** Bijamrita, SVI-I, SVI-II Germination percentage, Rajma

Introduction

In the world of agriculture, finding innovative ways to improve seed quality and enhance crop yield is of paramount importance. Organic farming is drawing attention of the world since past few years; it is environment friendly, sustainable way of farming with zero use of chemicals. Adoption to ecofriendly and sustainable farming practices like use of organic treatments can not only reverse the declining trend in global productivity but also will help in environment protection (Naikwade *et al.*, 2012). One such emerging technique is the use of Bijamrita, a natural and eco-friendly seed treatment solution. beejamritha is gaining popularity among farmers for its potential to boost germination rates, improve seedling vigor, and strengthen disease resistance

Bijamrita is a traditional seed treatment technique that originated in ancient Indian agriculture. It involves the preparation of a nutrient-rich mixture that is applied to seeds before sowing. The name “beejamritha” is derived from the Sanskrit words “Bheej” meaning seed and “Amrutha” meaning nectar, emphasizing its potential to revitalize and nourish seeds. The natural ingredients in Beejamritha create an environment conducive to robust plant growth, promoting the establishment of healthy seedlings. The traditional wisdom embedded in this organic seed treatment method aligns with sustainable agricultural practices, offering an eco-friendly alternative to synthetic treatments.

In the high-altitude tribal (HAT) zones, rajmash (*Phaseolus vulgaris* L., 2n = 22), commonly referred to

as rajma, kidney bean, French bean, dry bean, or field bean, is cultivated over an area of approximately 4,000 hectares during the early *Rabi* season. Rajmash is a valuable and widely consumed pulse crop, particularly in North India. However, its average productivity in India remains significantly lower compared to other major producing countries, primarily due to a combination of biotic and abiotic stress factors.

In these regions, rajmash is predominantly cultivated on hill slopes under traditional farming systems, where seed treatment practices are generally neglected. Moreover, the initial establishment and early seedling growth of the crop under field conditions tend to be slow and suboptimal. Considering these challenges, the present investigation was undertaken to identify effective seed treatment options utilizing locally available, environmentally sustainable materials aimed at improving seed germination and early seedling vigor in rajmash.

Materials and Methods

The lab experiment was conducted during *rabi 2024* at the Regional Agricultural Research Station, Chintapalli. The study comprised seven treatments replicated four times, arranged in a completely randomized design (CRD). Urine and dung used in these formulations were collected from local *desi* breed of cows. The bijamrita and other liquid formulations are prepared by following the standard procedures.

Beejamritha preparation

Bijamrita solution was prepared by using locally available ingredients as listed in Table 1. Method of preparation was followed as given by Palekar, (2007). 5 Kg of local cow dung was taken in a cloth and bound by tape and was submerged in 20 liters of water for 12 hrs. Simultaneously, 50g of slaked lime was dissolved in 1liter of water in separate container and kept stable for overnight. After 12 hours, this bundle of cow dung was squeezed thrice, thereby all the essence of cow dung will be drawn to water phase (cow dung extract). 1Kg of soil was dissolved in cow dung extract by stirring it well. To this, 5liters of wild cow urine and lime water was added and mixed well. The seeds were immersed in Bijamrita solutions of different concentrations (25%, 50%, 75% and 100%), local cow dung extract, Local cow urine and control *in* 1:1 ratio for 12 hours then dried in shed and later used for germination study**.**

Preparation of cow dung extract :1 kg of fresh *desi* cow dung was taken and mixed with 10 liters of water then extract was filtered with cloth. Afterwards 5 liters of water was added to the filtrate and filtration process was repeated. Then clear cow dung solution (extract) obtained used for seed treatment solution. The seeds were immersed in Cow dung Extract solution for 12 hours then dried in shed and later used for germination study.

Local cow urine: Local cow urine was used without addition of another ingredient. 500 ml of cow urine was diluted in 2 ½ liters of water. Then seeds to be treated were tied in plain cotton cloth and soaked in the cow urine for 12 hours and then seeds were dried in shade before use.

Seed germination

Seeds of rajma crops commonly grown in Alluri Sitaramaraju district were collected. Germination percentage was calculated by following paper towel method i.e. between paper method (BP Method). These seeds were treated with different concentrations of standard Bijamrita (25%, 50%, 75% and 100%), Local cow dung extract, Local cow urine and compared with control *i.e.* distilled water for 6 hours duration. Twenty-five healthy and uniform seeds were selected and placed in between paper towel. After treatment the paper towels are maintained at optimum temperature and humidity till seven days.

Treatments: Seven treatments with four replicates each T_1- Bijamrita 25%, T_2-Bijamrita 50%, T_3-Bijamrita 75%, T_4- Bijamrita 100%, T_5-Local cow dung extract, T_6 -Local cow urine and T_7 -Control.

Seed germination (%)

Seed germination percentage was calculated after seven days by using following formula (Sumithra *et al.*,2006).

$$Germination\,(\%) = \frac{No.\,of\ seeds\ germinated}{Total\ No.\,of\ seeds\ kept\ for\ germination} \ x100$$

Seedling length (cm)

From all seven treatments five normal seedlings were selected by random selection method from four replicate in each treatment (20 seedlings for one treatment) after seven days of germination. total seedling length was measured and mean length was calculated.

Seed Vigor Index (SVI)

Seed Vigor Index (SVI) was determined by following Baki and Anderson (1973) by using formula

$$Seedling\ vigor\ Index\ (SVI\ I) = Germination\ percent\ x\ seedling\ length(cm)$$

Seed Vigor Index (SVII)

Seed Vigor Index (SVI) was determined by following Baki and Anderson (1973) by using formula

$$Seedling\ vigor\ Index\ (SVI\ II) = Germination\ percent\ x\ seedling\ dry\ weight\ (g)$$

Statistical Analysis

All the results were statistically analyzed using analysis of variance (ANOVA) test and treatments means were compared using the least significant difference (C.D. P = 0.05) which allowed determination of significance between different applications.

Results and Discussion

The effect of different concentration of bijamrita and other organic liquid formulation on the seed ling growth and vigor parameters of rajma seeds was presented in Table.1.

The germination percent of rajma seeds was significantly affected by different concentration of bijamrita and other organic liquid treatments (Table 1). Highest germination percentage (97%) was recorded in seeds treated with 100% Bijamrita (T4) followed by the seed treatment with bijamrita 75% (T3). The lowest germination percent (87.67%) was recorded in seed treatment with water (control).

Seedling length of rajma seeds was significantly affected by the different concentration of bijamrita and other organic liquid treatments (Table.1). The highest seedling length (26.39 cm) was recorded in seeds treated with 100 % bijamrita (T4) followed by seed treatment with 75% bijamrita treatment (22.64 cm) and lowest seedling length (15.94 cm) was recorded in seeds treated with water (control) treatment.

Seedling fresh weight of rajma seeds was significantly affected by the different concentration of bijamrita and other organic liquid treatments (Table 1). The highest seedling fresh weight (1.61 g) was recorded in seeds treated with 100 % bijamrita (T4) followed by seed treatment with 75% bijamrita (T3) treatment (1.39 g) and lowest seedling fresh weight (0.85 g) was recorded in seeds treated with water (control) treatment.

Seedling dry weight of rajma seeds was significantly affected by the different concentration of bijamrita and other organic liquid treatments (Table.1). The highest seedling dry weight (0.26 g) was recorded in seeds treated with 100 % bijamrita (T4) followed by seed treatment with 75% bijamrita (T3) treatment (0.22 g) and lowest seedling dry weight (0.13 g) was recorded in seeds treated with water (control) treatment.

Seedling vigor index I (SVI-I) of rajma seeds was significantly affected by the different concentration of bijamrita and other organic liquid treatments (Table.1). The highest seedling seedling vigor index I (2561.27) was recorded in seeds treated with 100 % bijamrita (T4) followed by seed treatment with 75% bijamrita treatment (2132.31) and lowest seedling length (1397.21) was recorded in seeds treated with water (control) treatment.

Seedling vigor index II (SVI-II) of rajma seeds was significantly affected by the different concentration of bijamrita and other organic liquid treatments (Table.1). The highest seedling vigor index II (25.14) was recorded in seeds treated with 100 % bijamrita (T4) followed by seed treatment with 75% bijamrita treatment (21.03) and lowest seedling length (11.21) was recorded in seeds treated with water (control) treatment.

The reason behind the better performance of Bijamrita treatment is may be the components and microorganisms associated with it. Swaminathan (2005) showed that naturally occurring beneficial microorganisms mainly bacteria, yeasts, actinomycetes, photosynthetic bacteria and certain fungi were detected in cow dung which is one of component of Bijamrita. Bijamrita contain macro as well as micro nutrients, many vitamins, essential amino acids, growth promoting factors like Indole Acetic Acid (IAA), gibberellic acid (GA) and beneficial microorganisms (Natrajan 2007, Sreenivasa 2010).

Maximum colonies of bacteria, fungi, actinomycetes, N-fixers and P-solubilizers were present in Bijamrita on the day of preparation and later there was sharp decline in their number as the days elapsed and maximum CFUs of bacteria (623), fungi (22) actinomycetes (2), N-fixers (71) and P-solubilizes (52) were recorded on the day of preparation of Bijamrita. (Devakumar *et al.*,2014). The presence of beneficial microorganisms in organic liquid formulation might be mainly due to their constituents such as: cow dung, cow urine, legume flour and jaggery and associated microorganisms and their products (Palekar, 2006; Sreenivasa *et al.*, 2010).

Conclusion

In conclusion, locally prepared organic formulations such as Bijamrita are an effective, low-cost alternative for enhancing rajma seed performance. Among the treatments evaluated, 100 % Bijamrita achieved the highest germination rate, greatest seedling length, and superior Seed Vigor Index. Its simple preparation from readily available ingredients makes it accessible to growers, and routine use could markedly reduce reliance on synthetic chemicals and associated environmental pollution.

Table 1: Effect of beejamritha seed treatments on the germination parameters, seedling weights and seeding vigor of Rajma

Treatments	Germination percent (%)	Seedling length (cm)	Seedling Fresh weight (g)	Seedling Dry weight (g)	SVI-I	SVI-II
T1- seed treatment with beejamritha 25%	93.67	17.57	1.18	0.14	1645.87	12.72
T2- Seed treatment with beejamritha 50%	91.33	20.17	1.13	0.13	1836.82	12.08
T3-Seed treatment with beejamritha 75%	94.33	22.64	1.39	0.22	2132.31	21.03
T4-Seed treatment with beejamritha 100 %	97.00	26.39	1.61	0.26	2561.27	25.14
T5- Seed treatment with local dung extract	90.00	20.48	1.27	0.16	1976.02	15.22
T6- seed treatment with local cow urine	92.00	19.35	1.18	0.15	1780.77	13.56
T7- Seed treatment with water	87.67	15.94	0.85	0.13	1397.21	11.21
S.E(m)±	***0.072***	***1.550***	***0.049***	***0.016***	***140.638***	***1.483***
C.D (P=0.05)	***0.221***	***4.746***	***0.150***	***0.048***	***430.714***	***4.542***
C.V	***1.290***	***13.182***	***6.898***	***15.975***	***12.792***	***16.204***

Fig. 1: Effect of 100% Bejamritha seed treatment on the seedling growth

Fig. 2 : Performance of rajma seed under control treatment

Fig. 3: Preparation of Bejamritha solution

Fig. 4: Preparation of cow dung extract solution

Future Prospects

To elucidate the underlying physiological and biochemical pathways particularly the uptake, translocation, and mode of action of Bijamrita key constituents further targeted research is warranted. Overall, Bijamrita offers a sustainable seed-treatment strategy that farmers can readily adopt to improve crop establishment and promote eco-friendly agriculture.

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