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Enhancing germination and seedling vigour in cluster bean by organic priming

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The experiment was conducted at Department of Seed Science and Technology, Agricultural College and Research Institute, Madurai during 2014-2015, to find out the effect of organic seed priming with cow urine at different concentrations. The cluster bean seeds were soaked for 3 h with different concentrations *viz.,* 2, 4, 6, 8 and 10% along with water and control (no treatment). The seed quality parameters *viz.*, speed of germination, germination, root length, shoot length, vigour index I, vigour index II and dry matter production were evaluated. The best performance was observed in cow urine (2%) by recording highest seed quality parameters. The percentage increase over control was 10.52, 8.16, 9.8, 8.0, 16.34, 15.36 and 7.8 for speed of germination, germination percentage, root length, shoot length, vigour index I, vigour index II and dry matter production, respectively.

Key words: Bovine urines, cluster bean, pre sowing seed treatment, vigour index-germination.

INTRODUCTION

Cluster bean [*Cyamopsis tetragonoloba* (L.) Taub] (2n=14) is an under exploited leguminous vegetable belonging to the family Fabaceae. It is commonly known as *Guar, Chavli kayi, Khurtti.* Guar is grown in *kharif* season in arid and semi arid regions of India. It is a drought hardy, deep rooted, summer annual legume. Guar is the most important and potential vegetable cum industrial crop grown for its tender pods for vegetable purpose and for endospermic gum (30 to 35%).

In India, cluster bean occupies an area of 2.20 million ha with a production of 0.60 million tonnes (2005). In North Indian states like Rajasthan, Haryana, Gujarat and Punjab it is mainly cultivated for guar gum production and for forage, whereas in South India it is being cultivated for vegetable purpose. From India, cluster bean is mainly exported to USA, Germany, Netherlands, UK, Japan, and France value at Rs. 200 million rupees annually (Sing et al., 2009). Due to environmental concerns, there is an urgent need to reduce the use of chemical fertilizers and pesticides in agriculture and horticulture and alternative to chemicals are being sought to improve crop establishment and health. One option is the use of organics nutrients or growth regulators to seed or roots, which may promote plant growth or provide diseases control through a variety of mechanisms, including supply of organic nutrients production of plant hormones,

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antibiotic or enzyme; induced systemic resistance; direct parasitism of plant pathogen or deleterious micro-organisms; or competition with pathogen for or nutrients. Further, organic seed is a crucial link in the chin from research to organic seed production and ultimate supply of high quality seed at reasonable price to the commercial seed producing farmers for promotion of organic seed production. Hence, the safe and feasible approach is the priming of seeds with organics which are safe, eco friendly, economical and easily available. Organic seed priming provides hardiness to high temperature, low moisture especially in semi arid tropics. It promotes faster germination, higher seedling vigour leading to higher crop productivity. The main benefits of organic seed treatments include increased phosphate levels, nitrogen fixation and root development.

Cow urine contains about 1.0% nitrogen, traces of P_2O_5 and 1.0% of K_2O. Approximately 2400 to 2500 L of urine are produced per year per animal (Yawalker et al., 1996). If this urine were not conserved, nitrogen in the urine, which is mainly in the form of urea, would be quickly lost as ammonia. It is also considered as a natural disinfectant and pest repellent and forms the main component of Panchagavya (an organic crop booster prepared and sprayed by Indian farmers) (Tharmaraj et al., 2011). Organic seeds priming is more affordable so even small scale farmers can practice. Keeping into view its importance as a vegetable and its adaptability to arid drought conditions, there is need for its improvement for yield. This can be achieved by maintaining plant population by organic seed priming.

MATERIALS AND METHODS

Genetically pure seeds of cluster bean (Pusa Navbahar) used for the study. The experiment was conducted at Department of Seed Science and Technology, Agricultural College and Research Institute, Madurai during 2014. The seeds were treated with cow urine at the concentration of 2, 4, 6, 8 and 10% along with water and dry seed as control. Seeds were soaked for 3 h and shade dried. The seeds were tested for the standard germination test adopting between paper (BP) method as per the ISTA rules (Anon., 1996). The germination room maintained at 25 ± 2°c temperature and 90 ± 3 % RH. The seeds showing radical protrusion were counted daily from third day after sowing until fourteenth day. The speed of germination was calculated using the formula by Maguire (1962). Hundred seeds were placed in between paper using four replications and per cent germination was recorded. At the time of germination count, ten normal seedlings were selected at random from each replication and used for measuring the root length of seedlings. Root length was measured from the point of attachment of seed to the tip of primary root. The mean values were recorded and expressed in centimeter. The seedlings used for measuring root length were also used for measuring shoot length. The shoot length was measured from the point of attachment of cotyledon to the tip of the leaf and the mean values were recorded and expressed in centimeter. Vigour index values were computed using the following formula and the mean values were expressed in whole number (Abdul-Baki and Anderson, 1973). Vigour index I = Germination (%) × Total seedling length (cm) and vigour index II =. Germination (%) × dry matter production (g/10 seedlings). The data from various experiments were analyzed statistically adopting the procedure described by Panse and Sukhatme (1985). Wherever necessary, the percentage values were transformed to arc sine values before carrying out the statistical analysis.

RESULTS AND DISCUSSION

All the concentrations of cow urine increased the seed quality parameters. Among the concentrations, seeds primed with cow urine at 2% recorded increased speed of germination (9.5), germination percentage (98%), root length (14.47 cm), shoot length (16.05 cm), vigour index I (2991), vigour index II (49.98) and dry matter production (0.51 g/10 seedlings) compared to control (8.5, 90, 13.05, 14.75, 2502, 42.30 and 0.47) for speed of germination, germination percentage, root length, shoot length, vigour index I, vigour index II and dry matter production respectively).

Milch animal urine (cow / buffalo) contains about 1.0% nitrogen, traces of P_2O_5 and 1.0% of K_2O and approximately 2400 to 2500 L of urine are produced per year per animal (Yawalker et al., 1996). The reason for increased seed physiological parameters observed in the study may be due to the fact that bovine urine contains physiologically active substances *viz*., growth regulators, nutrients (Kamalam and Rajappan, 1989) and trace elements (Munoz, 1988). Illango et al. (1999) reported increased total chlorophyll content (1.80 mg/g fresh weight) and soluble protein (2.78 mg/g) upon soaking *Albizia lebbeck* seeds in cow urine in comparison to check (1.66 and 2.5 mg/g). Significantly higher plant height (74.21 cm), leaf dry weight, more number of tillers (137.4) were recorded 60 days after sowing, higher leaf area duration (2.47), higher straw yield (3388 kg / ha) was recorded for wheat seeds soaked in 10% cow urine (Shivamurthy, 2005).The cow's urine treatment with 1: 10 concentration was found very suitable to treat seeds of finger millet for good germination and seedling vigour. Shankaranarayanan et al. (1994) also reported that soaking of tamarind seeds in 10% cow urine or cow dung solution for 24 h increased the germination and vigour index as compared to that of untreated seeds. Our results were in close conformity with the findings in *Albizia lebbeck* (Ilango et al., 1999), jamun (Swamy et al., 1999), asparagus (Misra et al., 2002), Shivamurthy (2005) in wheat and Sivasubramaniyam et al. (2012) in pulses (Tables 1 and 2; Figure 1).

Conclusion

It could be concluded that cow urine (2%) can be recommended as organic seed priming for increasing the vigour in cluster bean under rain fed ecosystem.

Conflict of Interest

The authors have not declared any conflict of interest.

Table 1. Effect of organic seed priming with cow urine on speed of germination, germination percentage and root length (cm) in cluster bean.

Treatments	Speed of germination	Germination (%)	Root length (cm)
Cow urine (2%)	9.5	98 (82.17)	14.47
(4%)	9.4	98 (82.17)	14.22
(6%)	9.2	97 (80.15)	13.75
(8%)	9.0	96 (79.06)	13.50
(10%)	8.7	93 (74.79)	13.20
Hydro priming	9.1	97 (80.15)	13.68
Control	8.5	90 (71.56)	13.05
Mean	9.1	96 (79.06)	13.70
SEd	**0.188**	**1.990**	**0.285**
(P=0.05)	**0.392****	**4.139****	**0.593****

(Figures in the parentheses are arc sine transformed values), **- Significant at 5% level.

Table 2. Effect of organic seed priming with cow urine on shoot length (cm), vigour index I and vigour index II in cluster bean.

Treatments	Shoot length (cm)	Vigour index I	Vigour index II
Cow urine (2%)	16.05	2991	49.98
(4%)	15.25	2888	49.00
(6%)	15.20	2808	47.53
(8%)	15.12	2748	47.04
(10%)	14.86	2610	44.64
Hydro priming	15.03	2785	47.53
Control	14.75	2502	42.30
Mean	15.18	2762	46.86
SEd	**0.316**	**57.576**	**0.976**
CD (P=0.05)	**0.657****	**119.737****	**2.031****

**- Significant at 5% level.

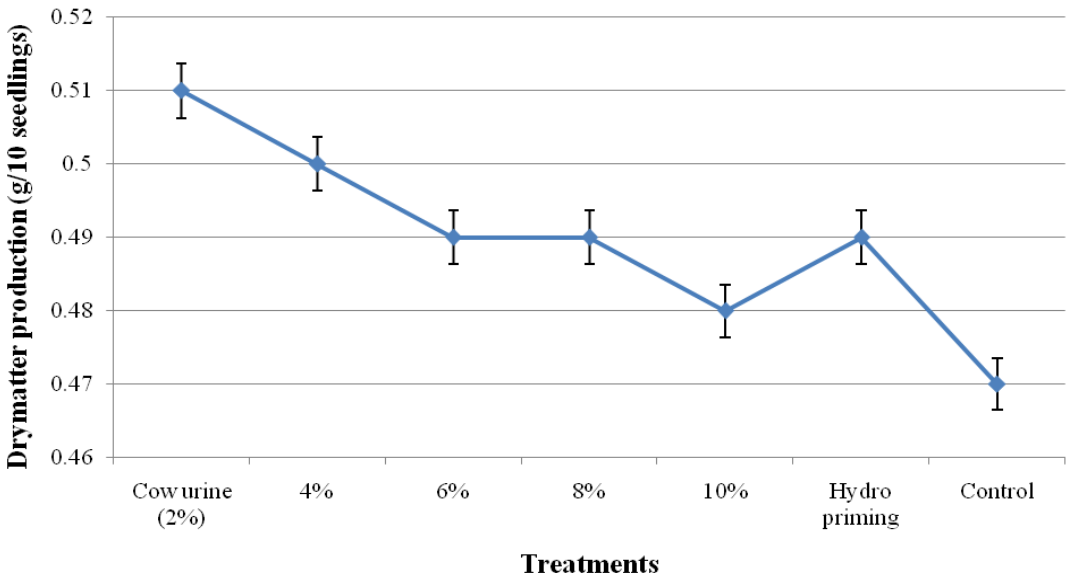

Figure 1. Effect of organic seed priming with cow urine on dry matter production (g/10 seedlings) in cluster bean.

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