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Effect of GA_3 and cow urine on seed germination and seedling growth of custard apple

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Abstract

The objective of this study was to determine the effect of GA_3 and cow urine on seed germination and seedling growth of custard apple. The results of present study showed the significant differences with respect to effect of seed soaking in different concentration of GA_3 *i.e.*, 200, 400, 600 ppm and cow urine with 15% and 20% also and in combination. Seeds were soaked for 72 hours in all treatments. Result of study revealed the positive effect of GA3 alone and in combination with cow urine in germination percentage, seedling growth, seedling diameter, no. of leaves and vigour index. Among the various treatments, GA3 (400ppm) in combination with cow urine (15%) exhibited the germination (92.405), whereas it was showed lowest in control (50.07%). However, GA_3 alone had also positive effect on its germination and seedling growth.

Key Words: *Annona squamosa, cow urine, GA_3, seed germination*

Introduction

Custard apple is successfully growing in humid to arid and semi arid region. It is highly suitable for the utilization of dry waste land areas due to its drought hardy nature and less water requirement. The custard apple have very short fruiting season about six month, flowering start with onset of monsoon and fruit harvest in end of October-November. The plant remains in dormant condition from December to May in hot semi arid condition. Therefore, custard apple can be successfully grown in these areas under natural delayed monsoon rain only. The propagation of custard apple through seed is difficult due to seed dormancy, which shows low uneven and irregular germination of seed. In many plants, viable seeds unable to germinate after sowing in right time and even under favourable environmental conditions. This seed condition is known as seed dormancy (Taiz, Zeieger 2002). Seeds are most important for easy propagation and future breeding programme of particular fruit crops. There are numbers of internal factors responsible for seed dormancy like hard seed coat factors, embryo factors or inhibitors (Agrawal and Dadlani 1995). Few methods are being commercially utilized to overcome dormancy, which vary from species to species, like heating, stratification, scarification and gibberellins application (Black, 1980 and Narbona et al. 2003). In above status methods, GA3 treatment of seeds were found most effective to break dormancy and influence the seed germination but it concentration vary from species to species (Karam, Al-Salem 2001).

Generally Custard apple requires 25-40 days for seed germination in normal condition (Hernandez, 1983). So far, little work has been carried out on this aspect in custard apple particularly under dry land condition. Therefore, seed treatment of custard apple with organics is required to improve germination. In order to avoid the problem of irregular germination and also to reduce germination period, seed treatment of custard apple seed is very important. Therefore, this study was conducted to find out the effect of GA_3 and organics on seed germination and seedling growth of custard apple under hot semi arid condition.

Material and Methods

The present study was carried out at nursery unit of Central Horticultural Experiment Station (ICAR-CIAH), Vejalpur, Panchmahals during 2016-2017. The experiment was laid out in randomized block design with three replications. There were twelve treatments like T_1: seed soaking in tap water for 72 hours (control), T_2: seed soaking in 15% cow urine for 72 hours, T_3: seed soaking in 20 % cow urine for 72 hours, T_4: seed soaking in 200 ppm GA_3 for 72 hours, T_5: seed soaking in 400 ppm GA_3 for 72 hours, T_6: seed soaking in 600 ppm GA_3 for 72 hours, T_7: seed soaking in 200 ppm GA_3+15% cow urine for 72 hours, T_8: seed soaking in 200 ppm GA_3 +20% cow urine for 72 hours, T_9: seed soaking in 400 ppm GA_3 +15% cow urine for 72 hours, T_{10}: seed soaking in 400 ppm GA_3+20% cow urine for 72 hours, T_{11}: seed soaking in 600 ppm GA_3 +15% cow urine for 72 hours and T_{12}: seed soaking in 600 ppm GA_3 +20% cow urine for 72 hours.

Collection of Cow Urine

Fresh cow urine of local variety of cow was collected from a local animal farm. The urine was filtered through Whatman No. 1 filter paper to get rid of debris and precipitated material was used as seed soaking.

Collection of Seeds

The seeds of custard apple were collected from fully mature fruits of Balanagar custard apple variety at Central Horticultural Experiment Station (ICAR-CIAH) farm, Vejalpur, Panchmahals.

After treatments, and completion of soaking period (72 hours) fully soaked seeds were selected and sown in 10th June 2017 at uniform distance in polythene bags. The size of polythene bag is 11 x 9 cm and each polythene bag consists of 5 seed, means each treatment has 10 polythene bags. Every polythene bag was filled with a composite media, which consists of soil, FYM and sand in ratio of 1:1:1. The percentages of germination of seeds were calculated according to the rules for seed testing (ISTA, 1996). The seedlings were allowed to grow for six months (June to November, 2017). After six months, 10 seedlings for each treatment were selected for measuring growth parameters; shoot and root length, seedling diameter and number of leaf. The data on germination and seedling growth under various treatments were statistically analyzed. Vigour index was calculated according to Abdul-baki and Anderson (1973) as germination per cent × seedling total length (total shoot + root length). The data was analyzed by statistical significant at $p<0.05$ level, S.E. and C.D. at 5 per cent level by the procedure given by Gomez and Gomez (1984).

Result and discussion

Effect on germination

The germination percentage of custard apple seed treated with GA_3, cow urine and its combination are summarized in Table & fig (1), the differences between treatments and control were significant 25, 30 and 35 day after sowing. Results showed that treatment of seeds with GA_3 and its combination with cow urine had markedly improved germination from 62.08 % and 92.4% when compare out with control 50.07%. It is clear from the Table1 that seeds treated with GA_3 alone and with combination of cow urine hasten the germination than untreated seed (control). The GA_3 and in combination with cow urine, the germination percentage at 25, 30, and 35 days after sowing was recorded as 10.56-18.42 %, 23.87-45.23 % and 26.85-34.62 %, respectfully. While in control and cow urine alone treated seed germination percentage was 6.23-10.23 %, 15.28-22.21 % and 28.56-31.23% in 25, 30 and 35 days after sowing, respectively. Result of study revealed that cow urine is not effective in hasten of seed germination. It may be due to presence of nutrients in cow urine (Phrimantoro, 1995) and very less amount of auxins substances (Palani et. al., 1995) which are unable to break the seed dormancy. High and early germination percentage for custard apple seed was found in GA_3 and in combination with cow urine treated seed. It may be due to synergic effect of cow urine and GA_4. The GA_3 hormone increase cell size of embryo (Black, M., 1980) by stimulating the cell wall to release and transmit its calcium in the cytoplasm which makes favourable condition for absorption of water and cell growth and activation of hydrolytic enzyme (Taiz & Zeieger, 2002; Roy, 1974) and cow urine might have provided essential elements that are needed by seed at time of germination such as N, P, K Ca, and Na and stimulate the hydrolytic enzyme. The highest germination percent was noted in T_9 (92.4%) followed by T_7 (87.94%), T_{11} (75.24%) and T_{12} (73.03%) while lowest was observed in T_1 (control) at 35 days after sowing (DAS) of seeds.

Effect on growth of seedling

In Table & Fig (1) results are shown the positive effects of GA_3 and cow urine treatment on shoot and root length, seedling diameter, no. of leaf/ young seedling and vigour index after germinated, The treatment T_9 gave the highest values ranging from 47.23 cm, 42.36 cm, 8.12 mm, 26.42 and 8278.116 comparing with the control 25.12 cm, 22.18 cm, 7.38 mm, 20.32 and 2368.311 respectively. Custard apple seeds treated with (400 ppm GA_3 + 15 % cow urine) germinated early and grown quickly which accelerate the difference in seedling growth, seedling diameter, number of leaf and vigour index. The present results are in agreed with the findings of Dzayi (2010). It may be due to growth promotional effect of GA_3; it stimulates and accelerates cell division, increased cell elongation and enlargement or both (Hartmann et al. 1990). Early germination caused by gibberellic acid which provided enough time to the plant for proper growth and development. However, cow urine gave positive effect on young seedling, may be due presence of essential plant nutrient and auxin substances and which ultimately resulted in increased length of root and shoot, diameter of seedling and leaf numbers. These finding more or less similar with finding of Sankaranarayanan et al. (1994); Vanagamudi (2003) in tamarind, Ilango et al. (1999) in Albizia lebbeck, Ramachandrudu and Thangam (2007) in gladiolus and Swamy et al. (1999) noticed highest germination per cent, shoot length and root length when jamun seeds.

In this study, we increase period of soaking seed because long time soaked seed gave higher germination due to maximum removal of germination inhibitor (Dzayi, 2010; Al- Hawezy, 2013). These finding closely related to the Kose (1998), which reported that *A. unedo* seed gave maximum germination when treated with 400 ppm GA_3.

From the foregoing discussion it can be concluded that among the different treatment, T_9 (seed soaking in 400 ppm GA_3 + 15 % cow urine for 72 hours) is found superior and most effective for seed germination and better growth of custard apple seedlings over the rest of the treatment combinations.

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Table 1. Effect of GA_3 and cow urine on seed germination and growth of custard apple seedling

Treatments	Germination %			Total germination %	Length (cm)		Seedling diameter (mm)	No. of leaf/seedling	Vigour index
	25 Days	30 Days	35 Days		Shoot	Root			
T_1	06.23	15.28	28.56	50.07	25.12	22.18	7.38	20.32	2368.311
T_2	08.26	22.21	31.23	61.7	31.27	34.23	7.42	21.56	4041.35
T_3	10.23	22.18	29.45	61.86	26.45	24.16	7.32	16.25	3130.735
T_4	11.89	27.56	28.12	67.57	28.12	22.45	7.62	17.38	3417.015
T_5	12.36	24.12	34.62	71.10	41.35	35.26	7.56	20.45	5446.971
T_6	10.56	24.63	26.89	62.08	32.25	36.85	7.60	21.45	4289.728
T_7	15.56	40.12	32.26	87.94	44.12	40.18	8.09	22.63	7413.342
T_8	11.58	23.87	33.26	68.71	38.26	40.23	8.00	24.00	5393.048
T_9	18.42	45.23	28.75	92.40	47.23	42.36	8.12	26.42	8278.116
T_{10}	15.23	30.54	26.85	72.62	42.56	40.23	7.63	20.47	6012.210
T_{11}	12.83	34.86	27.56	75.25	38.62	39.75	7.78	21.62	5897.343
T_{12}	12.46	32.45	28.12	73.03	37.42	38.16	8.10	17.56	5519.607
C.D. (P=0.05)	0.44	2.50	7.15	3.22	0.04	1.17	0.26	1.34	22.06

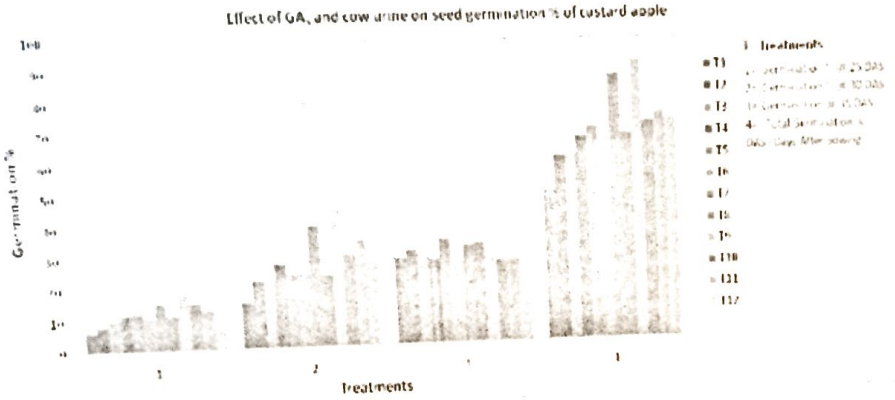

Fig. 1: Effect of GA_3 and cow urine on seed germination % of custard apple

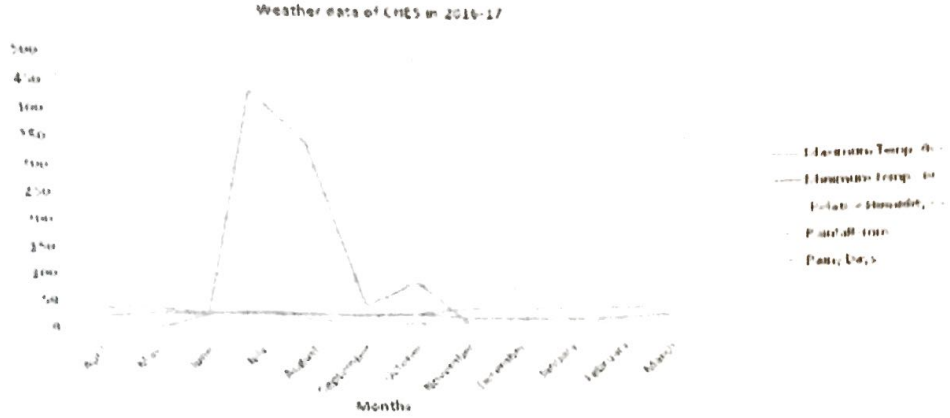

Fig. 2: Weather data of CHES in 2016-17

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