The Bioscan 9(1): 155-157, 2014
AN INTERNATIONAL QUARTERLY JOURNAL OF LIFE SCIENCES
www.thebioscan.in

EFFECT OF CHEMICALS AND GROWTH REGULATORS ON GERMINATION, VIGOUR AND GROWTH OF PASSION FRUIT (*PASSIFLORA EDULIS* SIMS.)

N. GURUNG[1]*, G. S. K. SWAMY[2], S. K. SARKAR[1] AND N. B. UBALE[1]
[1]Department of Fruits and Orchard Management, Faculty of Horticulture,
Bidhan Chandra Krishi Viswavidyalaya, Mohanpur - 741 252, West Bengal, INDIA
[2]Department of Fruit Science,
K.R.C. College of Horticulture, Arabhavi - 591 218, Belgaum Karnataka, India
e-mail: natashagurung23@gmail.com

KEYWORDS
Passion Fruit
Growth Regulators
Germination
Vigour

Received on :
13.09.2013

Accepted on :
21.12.2013

***Corresponding author**

ABSTRACT
An experiment was conducted during 2010-2011 to study the effect of chemicals and growth regulators on germination, vigour and growth of passion fruit. The study showed significant differences among the treatments. Maximum germination percentage (84%) and germination index (2.02) was observed in seeds treated with thiourea 1 per cent. Maximum seedling height 16.23cm, 19.62cm and 20.91cm and number of leaves 10.25, 11.35 and 14.25 were observed in seeds treated with GA_3 500 ppm at 30, 60 and 90 days respectively. Vigour index-I (1547.34 cm) and Vigour index-II (128.76 g) were recorded maximum in GA_3 500 ppm treated seeds. Also, the maximum fresh and dry weights of shoot were 3.76 g and 0.98 g respectively in GA_3 500 ppm treated seeds. The use of growth regulator is therefore recommended as an approach for propagation of passion fruits.

INTRODUCTION

Passion fruit (*Passiflora edulis* Sims.), a native of tropical America (Brazil), belongs to the family Passifloraceae is a high value and export oriented crop (Dupriez and De Leener, 1989). Passion fruit stands out not only for its exotic and unique flavour and aroma but also for its amazing nutritional and medicinal properties. It is cultivated in countries like Kenya, Australia, New Zealand, Hawaii, South Africa and Srilanka. India, too, has its place in passion fruit history. For several years, India has enjoyed a moderate harvest of purple passion fruit in the Nilgiris, Wynad, Kodaikanal, Shevroys, Coorg and Malabar in the South and in various parts of Northern India, especially Himachal and North East states like Manipur, Nagaland, Mizoram and Meghalaya.

The fruit can be grown to eat or for its juice, which is often added to other fruit juices to enhance aroma. There is an increase in awareness of the crop and production areas under passion fruit. But limited information is available on propagation techniques. To increase the productivity, there should be availability of good planting material along with proper management practices. The vine can be propagated sexually, through seeds and asexually by the use of cuttings, layering and grafting. Most of the planting material is produced from seeds and there are reports that do not present satisfactory germination (Osipi, 2000). Since the seeds exhibit slow and less germination, pre-germination treatments may enhance the germination potential of passion fruit seeds. Hence the study was carried out to increase the germination potential of passion fruit seeds with various treatments.

MATERIALS AND METHODS

The present investigation was carried out during the year 2010-2011 at K.R.C. College of Horticulture, Arabhavi in Belgaum district of Karnataka. The experiment was laid in completely randomized design with eight treatments comprised of Water soaking for 24 hrs, GA_3 250 ppm for 10 min., GA_3 500 ppm for 10 min., Vermiwash (1:5) for 24 hrs, Thiourea (1%) for 24 hrs, Cow urine(1:1) for 24 hrs, Cow dung slurry for 24 hrs and Control with three replications. Observations were recorded in respect of seedling height and number of leaves at 30, 60 and 90 days interval. Germination percentage was recorded. The germination percentage was worked out after complete germination, i.e., after stoppage of germination. It was calculated by dividing total number of seeds sown with the number of seeds germinated and was multiplied by 100. Fresh and dry weights of seedlings were also recorded. Seedling vigour was calculated based on the following formula (Bewley and Black, 1982).

Vigour index I = Per cent germination × Length of seedling

Vigour index II = Per cent germination × Total dry weight of seedling

RESULTS AND DISCUSSION

Germination

The germination per cent was maximum in Thiourea (84%) followed by GA_3 500 ppm (74%) whereas the minimum germination per cent was recorded in control (30%). The increased germination percentage in gibberellic acid treated seeds might be attributed to fact that the gibberellic acid helps in breaking the seed dormancy which results in early and enhanced seed germination due to the diffusion of endogenous auxin and gibberellins like substances (Pawshe *et al*., 1997). This result is in close conformity with the results obtained by Chandra and Govind (1990) in guava. GA_3 enhanced seed germination, because it might have antagonized the effect of inhibitors present in aonla seeds (Kumari *et al*., 2007). GA_3 triggers hydrolytic enzyme activities during germination (Dhankar and Singh, 1996). Improved germination with thiourea might be due to strong neutralizing effect of thiourea on inhibitor present in seed or might be due to the increased cytokinin activity by thiourea in overcoming the seed coat inhibiting effect (Hore and Sen 1994).

Growth parameters

The various vegetative growth parameters such as seedling height and number of leaves were found to be significant among the different treatments (Table 1). Maximum seedling height and number of leaves was observed with GA_3 500 ppm treated seeds. At 30 days after sowing (DAS) the seeds pre-treated with GA_3 500 ppm recorded significantly higher seedling height (16.23 cm) which was statistically on par with cow urine (15.02 cm), vermiwash (14.10 cm) and cow dung slurry (13.26 cm). Significantly least plant height was recorded in control (8.15 cm). At 60 DAS GA_3 500 ppm recorded significantly higher seedling height (19.62 cm) whereas control recorded less seedling height (9.67 cm). At 90 days after sowing, maximum seedling height was observed in seeds treated with GA_3 500 ppm (20.91 cm) which was on par with cow urine (18.22 cm). The influence of different pre-germination treatment on number of leaves produced by passion fruit seedling was found to be significant at all stages of growth except for 90 days.

Table 1: Effect of pre-germination treatment on vegetative parameters of passion fruit at different stages of growth

Treatment	Germination(%)	Seedling height (cm)			Number of leaves per seedling		
		30 DAS	60 DAS	90 DAS	30 DAS	60 DAS	90 DAS
T_1- Cowdung slurry	70 (56.78)	13.26	15.21	16.47	7.21	9.67	11.09
T_2- Water soaking	64 (53.13)	12.25	14.27	16.13	7.29	8.95	10.12
T_3- GA_3 250 ppm	44 (41.55)	8.95	11.95	17.95	6.89	7.25	10.62
T_4- GA_3 500 ppm	74 (54.35)	16.23	19.62	20.91	10.25	11.35	14.25
T_5- Vermiwash	56 (48.44)	14.10	15.02	16.03	6.13	9.29	10.87
T_6- Thiourea	84 (68.03)	10.03	12.12	15.06	7.01	10.61	11.12
T_7- Cow urine	40 (39.22)	15.02	16.29	18.22	5.95	8.21	9.75
T_8- Control	30 (33.25)	8.15	9.67	13.48	5.79	7.23	9.45
SEm ±	0.57	1.46	0.81	0.92	0.80	1.51	0.46
CD at 5%	1.71	4.38	2.45	2.77	2.42	4.52	1.36

DAS - Different days of sowing

Table 2: Effect of pre-germination treatment on shoot and root characters, plant biomass and vigour index in Passion fruit after 90 days of sowing (DAS)

Treatment	Shoot length (cm)	Root length (cm)	Fresh shoot weight(g)	Fresh root weight(g)	Dryshoot weight(g)	Dry root weight(g)	Vigour index-I(cm)	Vigour index-II(g)
T_1- Cow dung slurry	16.47	7.23	2.62	2.01	0.59	0.33	1152.9	64.40
T_2- Water soaking	16.13	7.65	2.53	1.21	0.66	0.34	1032.32	64.00
T_3- GA_3 250 ppm	17.95	9.82	3.15	2.25	1.27	0.67	789.8	85.36
T_4- GA_3 500 ppm	20.91	10.76	3.76	2.46	0.98	0.76	1547.34	128.76
T_5- Vermiwash	16.03	7.51	2.07	1.13	0.97	0.38	897.68	75.60
T_6- Thiourea	11.06	8.07	1.91	1.31	0.85	0.49	929.04	112.56
T_7- Cow urine	18.22	7.52	3.21	1.82	0.60	0.27	728.8	34.80
T_8- Control	13.48	6.23	1.12	0.87	0.41	0.23	404.4	19.20
SEm ±	1.27	0.48	0.31	0.35	0.13	0.01	1.15	1.08
CD at 5%	3.82	1.46	0.94	1.05	0.40	0.03	3.46	3.25

The increased height in GA_3 500 ppm seeds may be attributed to the reason that the endogenous levels of GA_3 synthesized by the passion fruit seedling might not be sufficient and external application of GA_3 might have boosted growth by increasing cell multiplication and cell elongation resulting in better plant growth. The results obtained in the present investigation are in close conformity with the results obtained by Pawshe *et al*., (1997). The increased seedling height in seeds treated with cow urine may be attributed to the presence of growth promoting substances (auxins) in cattle cow urine. These results are in accord with the results of (Shirol *et al*., 2005). The number of leaves per seedling (Table-1) was maximum with GA_3 500 ppm 60 days of sowing (11.35) followed by thiourea (10.61) whereas control recorded the minimum number of leaves (7.23). Increasing concentrations of GA_3 and thiourea also increased these parameters owing to invigoration of physiological process of plants and stimulatory increased rate of photosynthetic activity by the application of chemicals like GA_3 at particular chemicals like GA_3 at particular concentration accelerated the transport and efficiency of utilizing photosynthetic products resulting in the cell elongation and rapid cell division in the growing portion. (Chandra and Govind, 1990).

Shoot and root characters

The maximum shoot length(20.91cm) was recorded in seeds treated with GA_3 500 ppm, followed by seeds treated with cow urine and GA_3 250ppm. The root length was also found significantly higher in seeds treated with GA_3 500 ppm. Significant differences were found between the treatments with respect to fresh shoot and root weight and dry shoot and root weight (Table 2). Maximum fresh shoot and root weight was recorded in seeds treated with GA_3 500 ppm (3.76 g and 2.46 g) which was found to be statistically on par with cow urine (3.21 g and 1.82 g) and GA_3 250 ppm(3.15 g and 2.25 g). The highest root dry weight was recorded in GA_3 500 ppm (0.76 g) followed by GA_3 250 ppm (0.67 g) which was on par with each other. The highest dry weight (0.76 g) of root was recorded in GA_3 500 ppm treated seeds. The increased fresh and dry weight of seedling may be due to the enhanced root and shoot length. Thus the increase in root and shoot length and number of leaves have lead to the overall assimilation and redistribution of photosynthates within the plant and resulted in higher fresh and dry weight of seedling and increased dry matter assimilation (Choudhary and Chakrawar, 1982).

Vigour

Vigour index-I was found to be significantly highest (Table-2) in seeds receiving GA_3 500 ppm (1547.34) followed by water-soaking (1032.32). This might be due to increase germination and seedling height which have contributed to higher vigour index-I. Vigour index-II was found to be maximum (Table-2) in GA_3 500 ppm (128.76) followed by thiourea (112.56), the reason might be attributed to the increased dry matter production in the concerned treatments. (Rajamanickam *et al.,* 2004).

REFERENCES

Bewley, J. D. and Black, B. M. 1982. Germination of seeds. In: *Physiology and Biochemistry of Seed Germination*. Ed: Khan, A.A., Springer Verlag, New York, pp.40-80.

Chandra, R. and Govind, S. 1990. Gibberellic acid, thiourea, ethanol and acid treatment in relation to seed germination and seedling growth in guava (*Psidium guajava* L.,). *Prog. Hort*. **22(1-4):** 40-43.

Choudhary, B. K. and Chakrawar V. K. 1982. Note on the effect of some chemicals on the germination of Rangpur Lime seeds. *Indian J. Agric. Sci.* **51(3):** 201-203.

Dhankar, D. S. and Singh, M. 1996. Seed germination and seedling growth in amla as influenced by gibberellic and thiourea. *Crop. Res*. **12(3):** 363-366.

Dupriez, H. and De Leener, P. 1989. African Gardens and Orchards: Growing Vegetables and Fruits. Macmillan Publishers Ltd., London. p.333.

Hore, J. K. and Sen, S. K., 1994. Role of pre-sowing seed treatment on germination, seedling growth and longevity of ber (*Ziziphus mauritiana* L.) seeds. *Indian J. Agric. Res.* **28(4):** 285-284.

Kumari, R., Sindu S. S., Sehrawat, S. K. and Dudi, O. P. 2007. Germination studies in aonla (*Emblica officinalis* Gaertn). *Haryana J. Hort. Sci.* **36(1&2):** 9-11.

Osipi, E. A. F., 2000. Effect of temperature, fruit ripening and storage on physiological quality of seeds of passion fruit sweet *(Passiflora alata* Dryander). Thesis (Ph.D.

Horticulture) Faculty of Agricultural Sciences, University Estadual Paulista, Botucatu

Pawshe, Y. H., Patil, B. N. and Patil, L. P. 1997. Effect of pre-germination seed treatment on germination and vigour of seedlings in custard apple (*Annona squamosa* L.). *Annals Plant physiology.* **11(2):** 150-154.

Rajamanickam, C., Anbu. and Balakrishnan, K. 2004. Influence of seed treatments on seedling vigour in amla (*Emblica officinalis* G.) *South Indian Hort*. **52(1-6):** 324-327.

Shirol, A. M., Hanamashetti, S. I., Kanamadi, V. C., Thammaiah N. and Patil S. 2005. Studies on pre-soaking, method and season of grafting of sapota rootstock Khirnee. *Karnataka J. Agric. Sci.* **18(1):** 96-100.