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The Pharma Innovation

ISSN (E): 2277- 7695
ISSN (P): 2349-8242
NAAS Rating: 5.03
TPI 2021; 10(2): 480-482

www.thepharmajournal.com
Received: 10-12-2020
Accepted: 12-01-2021

Ankur Karde
M. Sc. (Ag) Student, Department of Horticulture (Fruit Science), JNKVV, Rewa, Madhya Pradesh, India

Rajesh Singh
Scientist (Horticulture) Krishi Vigyan Kendra, College of Agriculture, Rewa, Madhya Pradesh, India

Anshul Asre
M. Sc. (Ag) Student, Department of Horticulture (Fruit Science), JNKVV, Rewa, Madhya Pradesh, India

VP Singh
Assistant Professor, Department of Crop Physiology, College of Agriculture, Rewa, Madhya Pradesh, India

Corresponding Author:
Ankur Karde
M. Sc. (Ag) Student, Department of Horticulture (Fruit Science), JNKVV, Rewa, Madhya Pradesh, India

Influenced by different chemicals with storage period on germination and seedling growth of mango (*Mangifera indica* L.) stone under net house condition

Ankur Karde, Rajesh Singh, Anshul Asre and VP Singh

Abstract
An experiment entitled Effect of different chemicals with storage period on germination and seedling vigour of mango stone under net house condition. Was conducted in the Department of Fruit Science, College of Agriculture, Rewa. Year 2018-19. The treatments comprised combination of Control, Thiourea (3000 ppm) and GA_3 (300 ppm) with varying levels of stone storage period. Altogether, 18 treatments were applied in a factorial RBD with three repetitions. Imposition of treatments led to significant differences at 5% level of significance for all parameters chosen in this study. The results showed that the application of treatment M_2 (Thiourea at 3000 ppm) was found better higher germination percentage and length of sedling. While, M_2 (Thiourea at 3000 ppm) had enhanced plant growth by increasing seedling height, stem diameter, fresh weight of shoot and dry weight of shoot. In case of storage period in mango stone that the Fresh stone S_1 was found better higher germination percentage and length of seedling. While, Fresh stone S_1 had enhanced plant growth by increasing seedling height, stem diameter, fresh weight of shoot and dry weight of shoot. Interaction of S_1M_2 [Fresh stone + Thiourea at 3000 ppm] recorded non-significantly took the germination per cent also recorded significantly highest germination percentage.

Keywords: GA3, mango, germination, growth parameter and thiourea

Introduction
Mango one of the world's most delicious fruit, occupies a place of pride in this country and is rightly referred to as "King of fruit". Its sweet taste, pleasant flavour, attractive colour, nutritive value and various uses as fresh and preserved products are liked by "all" that is why it is commonly known as "AAM".

The cultivated Mango (*Mangifera indica* L.) belongs to the dicotyledonous family Anacardiaceae. It is most important fruit in the tropical and subtropical regions of the world. It is grown in the at least 110 countries but it is the most important fruit crop of India, where it occupies an area of 2263 thousand hectare with total production of 19687 thousand million tonnes (Anonymous 2017) [1], in which Madhya Pradesh, occupies an area of 40.08 thousand hectare and production is 494.36 thousand million tonnes (Anonymous 2017) [1].

Mango is propagated by sexual and asexual methods. Seed propagated plants are not producing true-to-type plant but those seedlings are used as rootstock for grafting. The stone loss their viability very soon. Seed viability of different crops was significantly affected by storage time. Longevity of seeds enhances the germination and seedling vigour by pre-treatment of growth regulator and chemicals. GA and Thiourea has been successfully used in improve the early germination and enhancing seedling growth and promote seedling vigour in different fruit crops like – mango, papaya, jackfruit, citrus etc.

The viability of mango stones is very low because stones are recalcitrant in nature. Germination percentage of mango stones is only 12 to 50 per cent when sown within one month after extraction (Gill *et al*., 1985) [5]. In India, mono embryonic non-descriptive seedlings are generally used as rootstocks. There is a large variation in germination and vigour, depending upon the location and region, where rootstocks are raised.

Pre-soaking treatments with chemicals like GA3, Thiourea, KNO3, and NAA are reported to influence the duration of germination, percentage emergence, seedling height, number of leaves and roots in several crop species (Rajamanickam *et al*., 2004) [12]. Gibberellic acid has been successfully used to improve the germination percentage in crops like mango.

Material and Methods

Present investigation was conducted in the Department of Fruit Science, College of Agriculture, Rewa from July- august during the year 2018. The experiment was laid out in a Factorial Randomized block Design with three replications with 18 treatment combinations. These fresh seed were collected and subjected to different pre-sowing treatments. The treatments comprised of Six levels of storage period in mango *i.e.* (S_1)- Fresh stone, (S_2)- Storage of stone for 15 days, (S_3)- Storage of stone for 30 days, (S_4)- Storage of stone for 45 days, (S_5)- Storage of stone for 60 days (S_7)- Storage of stone for 75 days as well as three levels of chemicals i.e. (M_1)- Control, (M_2)- Thiourea (3000 ppm) and (M_3) GA_3 (300 ppm). Observations were recorded in respect to first germination from the date of sowing up to germination of the first seedling, germination percentage at 20 DAS by counting number of papaya seeds germinated out of total seed dibbled into the plug trays and its average was calculated, 50% germination were calculated from date of sowing up to 50 per cent germination of seedlings, height of seedlings was measured by metric scale from the top of the shoot to the tip of root of the seedling, length of roots was measured by metric scale from the base of the shoot to tip of the roots, stem diameter was measured with the help of vernier calliper at height 1 cm above ground level, leaf area are measured with the help of leaf area meter, fresh weight of shoot was weighed on digital weighing balance and fresh weight of root was weighed on digital weighing balance 210 days after sowing and its average value was calculated.

Statistical analysis: The experiment was evaluated in Completely Randomized Design based on factorial concept. Data recorded was subjected to statistical analysis as per the method suggested by Panse and Sukhatme (1967) [10]. Treatment means were tested using F test values at 5% level of significance.

Results and Discussion

Effect of storage period

Fresh stone (S_1) gave minimum days (14.32) to germinate and days taken to 50% germination (16.45) days and germination percentage gave maximum germination percentage (76.66) the storage period significantly superior to other storage periods as well as Fresh stone (S_1) gave maximum length of seedlings at 210 DAS (49.30 cm), shoot diameter 2.85 cm and leaves count 22.36/plant and significantly superior to other treatments. The increase of storage period significantly minimise the seedling length Similar results were also obtained by Rekha *et al.* (2010), Bhavya *et al.* (2017) [2], Deepika and Vanajalatha (2016) [3] and Mahasin and Mustafa (2015) [7].

Effect of growing media

M_2 gave significantly result and superior to other treatment. It brought about earliest start of seed germination in 20.07 days, 50% germination in (21.88) days over rest the treatments M_3 (21.00). It was the ultimate beneficial impact of this treatment. On the other hand, the corresponding values in case of untreated check M_1 (21.54) days maximum period to start germination. 24.01 days taken to 50% germination, lowest seed germination (49.44%). M_2 continued to be the best with respect to length of seedlings, diameter of seedling and formation of more number of leaves per plant at different stages of observation. At 210 DAS stage, the maximum seedling length was 46.86 cm, shoot diameter 2.76 cm and leaves count 21.50/plant, and M_3 and M_1 gave at par result length of seedling, diameter of shoot and number of leaves/plant. These results were in close conformity with finding of Yallesh Kumar *et al*. (2018) [14], Patil *et al*. (2018) [11], Munde and Gajbhiye (2010) [8], Gholap *et al.* (2000) [4], Harshavardhan and Rajasekhar (2012) [6].

Interaction effect of Organic waste and growing media

Interaction of S_1M_2 [Fresh stone + Thiourea at 3000 ppm] recorded non-significantly took the germination per cent also recorded significantly highest germination percentage (86.66%) at 25 DAS as well as growth attributes *viz*., maximum height of seedling i.e. 49.69 cm, stem diameter i.e. 2.86 mm at 210 DAS, leaf area i.e. 34.65 cm^2, length of root i.e. 32.3 cm, fresh weight of root i.e. 10.84 g and Dry weight of root i.e. 5.15 g at 210 DAS. These results were in close conformity with finding of Gholap *et al.* (2000) [4] and Mahasin and Mustafa (2015) [7].

Table 1: Influence of different chemicals with storage period on seed germination and seedling growth of Mango

Treatments	Germination	Height of seedling (cm) at 210 DAS	Shoot diameter (mm) at 210 DAS	Length of root (cm) at 210 DAS	Fresh weight of shoot (g) at 210 DAS	Dry weight of root (g) at 210 DAS
T_1	76.66	49.30	2.85	31.15	10.38	4.88
T_2	66.66	48.12	2.81	28.78	9.57	4.12
T_3	60.00	47.60	2.77	26.29	8.17	3.33
T_4	50.00	46.34	2.71	23.19	6.80	2.63
T_5	42.22	44.43	2.68	21.26	5.55	2.29
T_6	26.66	41.23	2.65	18.6	4.72	1.92
T_7	76.66	49.30	2.85	31.15	10.38	4.88
S.Em. ±	2.085	0.243	0.004	0.416	0.152	0.104
C.D. at 5%	6.017	0.703	0.012	1.202	0.438	0.301
G_1	49.44	45.44	2.73	23.44	7.03	2.97
G_2	58.33	46.86	2.76	26.26	7.96	3.41
G_3	53.33	46.20	2.65	24.98	7.60	3.20
S.Em. ±	1.474	0.172	0.003	0.294	0.107	0.074
C.D. at 5%	4.254	0.497	0.009	0.85	0.31	0.213
Interaction G × M	N/S	N/S	N/S	N/S	N/S	N/S

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