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Different Stratification Techniques on Seed Germination of Pistachio cv. Wild.

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Abstract

A research project was envisaged to standardise a stratification technique for better seed germination and to produce a uniform rootstock for cultivation of pistachio. Seed were immersed in different solutions of KNO_3 1 per cent, MS salt, GA3 1 ppm, normal water and control (no treatment), for 12, 24, 36 and 48 hours duration before sowing in pots. It was found that KNO_3 at 1 per cent solution treated seeds significantly completed early germination in 135 days and increased the germination percentage to 26 per cent when soaked for 24 hours. Lengthy seedling of wild Pistachio (39.50 cm) was noted in the same solution for 24 hours immersion. Diameter of the seedling was pronounced in the above chemical at 1 per cent level of concentration.

Introduction

Pistachio (*Pistachia vera* L.) is a member of family Anacardiaceae. The pistachio is deciduous and dioecious which is drought resistant and very tolerant to hot and dry weather. Area suitable for commercial olive production is generally satisfactory for pistachio. This species is not planted on commercial scale above 2500 feet elevation because cool summer temperature does not promote good kernel development. Pistachio tolerates low winter temperature but is sensitive to spring frost. April frost may kill flowers and new vegetative growth. The pistachio does not tolerate high humidity in the growing season. The species is believed to be native to Asia. The commercial production of pistachio occurred in Iran, Syria and Iraq. In Pakistan some wild trees are growing in Quetta and Qalat divisions, while in Peshawar regions, the species is not existed.

The pistachio nut is very expensive among the other nuts and is held in great esteem amongst the well to do classes. The kernel of pistachio is used in costly sweets and it's wood serves the forestry needs. Wild species of fruit plants are generally used as rootstock in horticulture technology for many years in terms of yield, quality, longevity, resistance to soil born disease and adverse climatic conditions (Hortmann and Kester, 1983).

In Pakistan pistachio is usually grafted on cultivated pistachio which is reported to be highly susceptible to soil born diseases (Maranto, 1982). There is no proper rootstock for pistachio propagation available in the country except the wild pistachio. However, this species shows difficulties in seed germination under ordinary conditions. If a seed germinates it will produce very weak seedlings that will not be desirable for grafting purposes. Dry seeds of most temperate trees and shrubs even though mature, do not germinate and grow until they are chilled above freezing under moist conditions. Seed dormancy can be broken either by stratification, mechanical and chemical treatments. (Westwood, 1993). Grisez, (1974) reported that the process of stratification is varied from species to species. It has been reported by Broznik, 1960 that the

germination of peach stones gave 0-100 per cent sprouting and this capability varies from variety to variety. Cracking of seed will improve germination, while encroached seed will not give better germination (Aeroeira, 1962). Harmon and Weinberger, 1959 observed that copper fungicides were beneficial to break the dormancy of grape seed when applied to the seed. Tukey and Carlson, 1949 found that most favourable treatment to break the dormancy of lovell peach seed when soaked for 2-16 hours in the solution of thio-urea at 0.25 to 0.5 per cent. Khattak *et al.* (1991) investigated that early germination was noted in Peshawar local seeds (wild peach) stratified for a month in moist and also in Swat local stones (wild peach) treated in hot water at 30°C for 24 hours containing 2 g/l Dithane-M 45. Seed germination was improved by soaking seeds in water for 24 hours (Maranto, 1982). In the past, no proper research was conducted to use this indigenous species for horticultural purposes. A research project was envisaged to standardise a stratification technique for better seed germination and to produce a uniform rootstock for cultivation of pistachio.

Materials and Methods

A research trial was conducted at the green house of Directorate of Horticulture FATA, Agricultural Research Institute, Tarnab, Peshawar, during 1993-94, to enhance the seed germination percentage and to produce a uniform root stock of indigenous pistachio cv. wild. These were treated like no treatment (control), normal water soaking, KNO_3 at 1 per cent, 1/2 MS salt and GA3 1 ppm. The seeds were then immersed in the above aqueous solution for 12, 24, 36 and 48 hours, before sowing in the pots. The pots (1'height x 3'diameter) were filled with sand + clay + compost by volume (1+1+1). The seeds were sown in these pots on 24-10-1993. A hundred seeds were sown in a pot and the same number was also kept per treatment. The experiment was laid out in randomised complete block design with factorial approach, replicated 4 times. Mean values for number of days for germination completion, germination percentage, plants height and plant diameter were computed and separated by LSD test.

Table 1: Number of days required for germination completion of wild pistachio seeds as affected by various chemical treatments and duration.

Treatments	12 hours	24 hours	36 hours	48 hours
Control	195 g	195 g	180 ef	180 ef
Normal water	180 ef	180 ef	165 cd	165 cd
KNO ₃ 1%	160 c	135 a	140 a	150 b
1/2MS	180ef	170 de	180 ef	180 ef
GA3 1PPM	170 de	165 cd	165 cd	170 de

LSD at 5% : 8.2

Table 2: Percentage germination of wild pistachio seeds as affected by various chemical treatments and duration.

Treatments	12 hours	24 hours	36 hours	48 hours
Control	2.00 bcde	1.50 bcde	1.50 bcde	11.60 bc
Normal water	5.33 bcd	8.66 bc	16.60 b	19.80 b
KNO ₃ 1%	15.50 bc	26.00 a	20.60 b	18.00 b
1/2MS	7.00 bcd	5.00 bcd	8.00 bcd	7.80 bcd
GA3 ppm	8.66 bc	13.33 bc	10.00 bc	9.50 bc

LSD 5% 5.11

Table 3: Seedling height of wild pistachio seeds as affected by various chemical treatments and duration.

Treatments	12 hours	24 hours	36 hours	48 hours
Control	16.7 efgh	7.00 lj	4.00 j	15.0 fgh
Normal water	12.2 hi	15.50 fgh	17.50 dh	23.7 cde
KNO ₃ 1%	23.00 cd	29.50 a	30.00 ab	29.00 ab
1/2MS	13.00 hi	21.00 def	20.00 dg	28.00 bc
GA3 ppm	17.25 d-g	14.00 hg	14.50 hg	28.00 bc

LSD 5% 6.637

Table 4: Diameter of seedlings of wild pistachio seeds as affected by various chemical treatments and duration.

Treatments	12 hours	24 hours	36 hours	48 hours
Control	0.32 abc	0.20 de	0.12 e	0.32 abc
Normal water	0.30 bcd	0.27 cd	0.25 cd	0.25 cd
KNO ₃ 1%	0.30 bcd	0.52 a	0.25 cd	0.40 ab
1/2MS	0.27 cd	0.25 cd	0.25 cd	0.30 bcd
GA3 ppm	0.22 cde	0.20 be0	0.22 cde	0.25 cd

LSD 5% 0.1097

Results

Number of days to germination completion of pistachio: Mean values from number of days to germination completion were arranged in Table 1, which showed that potassium nitrate (KNO₃) at 1 per cent level for 24 and 36 hours significantly completed germination in shorter duration of 135 and 140 days respectively. Both of these treatments are statistically at par with each other. The second best treatment was KNO₃ at 1 per cent for 48 hours soaking that completed germination in 150 days. Normal water soaking for 36 hours and 48 hours and GA3 at 1 ppm for 24 hours and 36 hours soaking competed germination in 165 days. The treatments like normal water soaking for 12 hours and 24 hours and 1/2 MS salt for 12, 36, 48 hours required longer period to complete the seed

germination in 180 days. Control weather for shorter longer duration soaking was failed for early completion of pistachio seed germination. In this experiment it was found that KNO₃ at 1 per cent level was effective for early germination.

Germination percentage of seeds of pistachio: The data Table 2 revealed that potassium nitrate KNO₃ at 1 per cent solution significantly increased the germination percentage to 26 per cent when soaked for 24 hours in that solution. The same concentration also resulted better germination percentage of 20.6 per cent for 36 hours duration. Normal water soaking also resulted better germination percentage of 19.8 and 16.6 per cent in 48 hours and 36 hours duration respectively. The treatments MS and GA3 had given poor germination percentage under different duration. Although GA3 was comparatively better than MS salt in this experiment. Control had given the lowest germination percentage as compared to other treatments.

Seedling height (cm) of pistachio: It is evident from Table 3 that lengthy seedling of 39.50, 30.00 and 29.00 cm were noted in KNO₃ at 1 per cent concentration for 24, 36 and 48 hours duration in the solution, respectively. The treatments « MS and Gibberellic acid at 1 ppm for 48 hours duration also increased the seedling height to 28.00 cm. Normal water treatment for 48 hours soaking had produced 23.00 cm long seedling. It can be concluded from the above observations that KNO₃ at 1 per cent had outperformed other treatments in the experiment. The second best treatment was found « MS and GA3 1 ppm for 48 hours duration. The untreated seeds for 12, 24 and 36 hours duration resulted very shorter seedling height.

Seedling diameter (cm) of pistachio: Table 4 depicted that the diameter of the seedling was significantly increased by potassium nitrate (KNO₃) at 1 per cent level for 24 hours duration. The treatment resulted 0.5 cm thick seedling diameter. The same treatment at 48 hours duration also increased the seedling diameter to 0.40 cm. The other treatments including control was found to be inferior to seedling girth.

Discussion

In the trial pistachio cv. wild gave variable response to stratification treatments. Brozik (1960) and Grisez (1960) reported the same findings that process of stratification varied from species to species. Harmann and Weinberger (1959) noted that copper fungicides were beneficial to break the dormancy of grape seeds. Khattak *et al.*, (1960) reported that Diathane M-45 is helpful in breaking dormancy of wild peach stones. In the present experiment potassium nitrate at 1 per cent level and soaking the seed of wild pistachio for 24 and 36 hours resulted early germination completion, better germination percentage, lengthy and thicker seedling. The compound containing potas-

nitrate may be helpful for reactivation of metabolic process of pistachio seeds. This compound may cause biosynthesis of auxin, that ultimately trigger the growth of the embryo (Westwood, 1993). The results in this case corroborate with the findings of Khattak *et al.* (1991) who noted that Diathane M-45 is helpful in breaking the dormancy of peaches.

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