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Propagation Techniques in Watermelon

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ABSTRACT

Watermelon is cultivated for sweet and delicious juice during summer. Generally, watermelon is propagated by seeds. In watermelon, triploid seeds are produced by honeybee aided pollination and the manual pollination methods. The male fertile plants can be rogued out easily in the tetraploid female plants *i.e.* tetraploid male sterile plants. The Male and female parents are raised at 1:3 or 1:4 ratio. Generally, the fruits development and the color of seeds changed from brown to black at 60 days from the day of pollination. The seeds should be completely washed and separated from the flesh during extraction. The seeds should be dried in shade on nylon net and followed by sunlight. The seeds also dried in the forced-air dryer to maintain the quality. These seeds are graded by using specific gravity separator based on their density Watermelon seeds can be viable for three to four years if they are stored at 10 - 15 per cent moisture with a temperature of 14 - 20°C. Seven per cent moisture content for normal open storage and six per cent for moisture proof storage conditions should be maintained. The *Lagenaria leucantha* is highly suitable root stock with water melon as a scion to protect the watermelon plants from soil borne diseases and favours early harvest of the fruits. Few attempts are made to multiply tetraploid watermelon by using tissue culture protocols.

INTRODUCTION

Watermelon is botanically known as *Citrullus lanatus* and it is one of the important cucurbitaceous vegetables cultivated in summer months. These plants are grown into lengthy creeping vines. They have big size leaves with pale yellow colour flowers and juice rich fruits. These plants are cultivated for their delicious and sugary juice. The outer peel of the fruit is hard, green in colour with stripes. The edible inner core of the fruit is usually red in colour and rarely pink or yellow, with the flavour of pineapple. The watermelon hybrids with lesser number of seeds are preferred by the markets. The seedless watermelons with triploid nature recorded maximum yield compared to seeded varieties of diploids (Zhang, 2004).

A. SEED PRODUCTION

Generally, watermelon is propagated by seeds. Seeds can be tetraploid seeds and triploid seeds. Tetraploid seeds result in seeded watermelon whereas triploid seeds give seedless watermelon.

TYPES

Triploid seeds are produced by using natural bee pollination and hand pollination methods. For every two rows of tetraploid female lines, one row of diploid male line is planted. The unopened male flowers are disbudded in the female parents. The disbudded plants are marked and allow the same for bee pollination to set fruits. Then the triploid seeds are extracted from the fruits set in the marked flowers. Usually, male sterile tetraploid lines are having lesser number of male fertile plants and same can be easily removed by the workers with less time. The off types should be removed before flowering to ensure the production of triploid seeds (Zhang and Rhodes, 2000).

Tetraploid watermelons are produced in the protected structures and open field conditions with isolation.

SOIL AND CLIMATIC REQUIREMENTS

Arid climate is preferred for production of seeds with minimum disease occurrence. It performs well with dry climate and bright sunlight for getting quality seeds. The ideal temperature required for better growth and development is 24-27°C. Higher levels of humidity favour the incidence of fungal diseases. There is no additional water is required for first three days of sowing; if the relative humidity is 90 per cent during germination phase of the seeds. Normally, good ventilation with 70 per cent relative humidity is highly suitable (Anon., 2003).

The sandy loam soils with proper drainage are most suitable for watermelon cultivation. The soil pH between 6.5 and 7.0 is good for water melon. It can also grow up to the soil pH of 5.0.

SOWING

The best season for North India is January - February whereas in South India it is September - October. A spacing of 200cm x 150 cm is normally practiced. The seed rate followed is 1kg/ha for female parent and 250g/plant for male parent. The seeds are soaked in 500ml of water per kg of seeds for overnight at a temperature of 30°C. The sex ratio between male and female parents is 1:3 or 1:4. These parents can be raised in adjacent rows. The pit size required for water melon

is 60 x 60 x 45 cm. These pits are allowed as such for a week to reduce the field heat. Then, the pits are filled with 4-5 kg of farm yard manure by forming ring basins. Usually, three to four seeds were sown per pit with 2-3 cm depth. The seeds also sown in portrays by using coco-peat as a medium under controlled environment. These tray grown seedlings also transplanted in the main field for seed production. This system minimized the duration of the crop and enhanced the germination percentage in the main field.

WATER MANAGEMENT

Irrigation is done as necessary and irrigated sparingly for the first week. Excess irrigation is to be avoided. More water is required during early stages of germination and watering may be done once in 5-6 days at later stages of the growth. The root zone irrigation will minimize the disease incidence and rotting of fruits (Anon., 2003). Mulching over raised bed system of cultivation reduces the density of weeds (Anon, 2010).

NUTRIENT MANAGEMENT

Higher amount of phosphorus and potassium application (20-30% increase over normal cultivation) enhanced the seed yield and quality. Calcium should be applied in the soil to reduce the splitting of fruits.

Basal application of FYM @ 15-20 t /ha, 60-80:40-60: 60-80 kg of NPK is generally recommended. Calcium and boron can be applied at five to six weeks after sowing for good yield.

ISOLATION AND POLLINATION

The mode of pollination exists in water melon is cross pollination. The butter paper covers were used to cover the female flower buds before opening of flowers and remove the male flower buds in female lines. In male parents, male flowers opened in the next day are tied with a thread to retain pollens within the flower. The male flower buds are opened to sunlight during pollination. The pollination occurs between 7.00 am and 9.00am favours for good seed set. The isolation distance recommended for foundation and certified seeds are 1500m and 1000m respectively.

ROGUEING

The rogueing should be carried out at following phases of crop growth.

1. The off types should be removed based on the morphology, color and vine growth
2. The varieties can be identified by sex expression and sex ratio.
3. The rogueing should be done based on fruit characters
4. The plants are rogued out based on colour of flesh and seed, peel thickness and TSS
5. The disease infected plants are shall be removed immediately in all stages of growth.

SEED EXTRACTION

Generally, only one fruit per vine and two vines per plant is maintained. The vines are to be pruned at 45 DAS. Usually, the fruits are matured at 60 days after pollination and the seeds turned to black from brown. If the tendrils bearing the fruits on the node are withered, it showed maturity.

The seeds are to be washed and quickly dried during immediately after extraction. The forced air dryers may be used to retain the viability of the seeds. For large scale seed extraction, machineries are to be used (Tomar, 2010). The grading was done by using specific gravity separator.

STORAGE OF SEEDS

Seed moisture should be brought down to seven per cent for open storage and to six per cent for water proof storage conditions. The seed and field standards prescribed by the certification agencies should be followed.

B. VEGETATIVE PROPAGATION

The grafted watermelon plants protect the crop from soil borne pathogens and reduce the crop rotation cycle. The root stock *Lagenaria leucantha* is highly compatible with water melon. Around, 90 per cent of the grafted plants might survive (Jiang You-Tiao *et al*., 1980) if appropriate measures were taken to control climatic parameters.

C. MICRO-PROPAGATION

The shoot proliferation in tissue culture is briefly described as follows:

i) Collection of explants *viz.,* shoot-tips and axiliary buds from greenhouse, field or laboratory grown plants. The shoot tips and axillary buds are to be rinsed three times in sterilized distilled water.

ii) The shoot tips and axillary buds were cultured in the Murashige and Skoog (MS) medium with 10 μM BA for shoot proliferation. The sub-culturing should be done at every 3 - 4 weeks.

iii) The shoot buds proliferated with roots in the MS medium in combination with 5-10 μM IBA for two weeks.

iv) The rooted plantlets are acclimatized in a climate controlled greenhouse.

v) These micro-propagated plants are grown in an isolation and separate the seeds from these plants (Zhang *et al*. 1995).

CONCLUSION

The triploid watermelon seeds are recently multiplied by pollinating with bees and manual methods. The male and female parents are to be raised at 1:3 or 1:4 in adjacent rows. Usually, the fruits are matured at 60 days after pollination and the seeds are turned from brown to black during maturity. Then, the seeds are extracted and washed from the flesh. These extracted seeds are in a forced air dryer for maintaining the viability of the seeds. The *Lagenaria leucantha* can be used as a root stock with water melon to manage the crop from soil borne diseases. Micro-propagation techniques may be followed for multiplication of tetraploid water melons.

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