AgroScience Today

Popular Article

e-ISSN: 2583-0147

Volume 5 Issue 6
Page: 0873 - 0876

Propagation Techniques in Cucumber (Cucumis sativus L.)

Ashok Kumar .G[1], Savitha .B.K[1], Bini Sundar .S.T[1] and Prabhu .M[2]*

[1] Horticultural College and Research Institute, TNAU, Coimbatore, Tamil Nadu, India.

[2] Horticultural College and Research Institute for Women, TNAU, Tiruchirapalli, Tamil Nadu, India.

Corresponding author's e-mail: *muthusamyprabhu@gmail.com*

Published on: June 30, 2024

ABSTRACT

The cucumber is indigenous to India. It is commonly cultivated by seeds. The prices of hybrid cucumber seeds were about thrice compared to seeds of open pollinated varieties. The cucumber hybrids are developed by hybridizing gynoecious lines with monoecious lines. After removal of anthers in the female lines, pollination was carried out by bees. Two to three bee hives per acre are installed for effective pollination and fruit set. The ratio between female and male lines in the field should be 3:1. Well matured fruits at 65 days after anthesis are separated from the plant for extraction of seeds. Minimum isolation distance of 1000m from other cucurbits is needed for certified seeds and 1500m for foundation seeds. Haploids were produced by growing of anthers in the growing media added with 2,4, D and BA at different combinations through somatic embryogenesis.

INTRODUCTION

Cucumber (*Cucumis sativus* L.) is utilized as a salad or in pickle. The cucumber is native to India (de Candolle, 1886). The progenitor of cucumber is *C. hardwickii* and easily crossed with *C. sativus* (Deakin *et al*., 1971). Considerable amount of heterosis has been found in cucumber for growth and yield attributes.

It is a low calorie and high-water content vegetable. The fresh fruit contains essential amino acids, sugar compounds, fatty acids, vitamins and minerals (Esquinas-Alcazar and Gullick, 1983).

Cucumber is mainly multiplied by seeds. The prices of hybrid cucumber seeds are three times higher than the seeds of open pollinated varieties. The seeds are small, flat and white. One gram of seed contains around 35 seeds. The seeds will be sown at 2.5-5.0cm depth.

HYBRID SEED PRODUCTION

The Hybrids are produced by hybridizing gynoecious parents and monoecious parents. The homozygous gynoecious hybrid seed has been produced by hybridizing two gynoecious lines after one line was sprayed with GA_3 for induction of male flowers (Kubicki, 1970).

Peterson and Anhder (1960) found the effect of GA_3 on induction of male flowers in cucumber. The GA_3 sprays leads to irregular development of male flowers. The application of silver nitrate is tried to produce male flowers (Beyer, 1976). Silver thiosulphate is used to maintain gynoecious cucumber lines to avoid the phytoxic effects of silver nitrate.

USE OF GROWTH REGULATORS TO PROMOTE FEMALENESS

In monoecious cucumber lines, ethrel can be used to induce the formation of female flowers. Normally, ethephon is sprayed at the concentration of 250 to 500 ppm during first, third and fifth leaf stage (Peñaloza, 2001). These sprays inhibit the development of male flowers. The plants should be verified regularly in female lines to remove the male flowers before anthesis. After removal of male flowers in the female lines, honey bees can be employed for pollination. For one acre area, two to three bee hives are installed for effective pollination and fruit set. The ratio between female and male lines in the field should be 3:1.

SEED TREATMENT, SOWING AND PREPARATION OF NURSERY

The seeds of are dibbled in rows 1.8m apart and after thinning have 60cm in between plants. The daily temperature ranged between 18 -24°C. Lower temperatures reduced the growth rate and seedlings are vulnerable for damage of flea beetles.

The field should be free from volunteer plants. Cucumbers require a well-drained sandy loam soil for higher yield. Clay soils or ill drained soils are not suitable for cucumber. The optimum soil pH is 5.8 - 6.8.

TIME OF SOWING

Northern India-Summer - January to February.
Kharif - June to July.
Southern India - October to November.

AFTER CARE

Cucumber is a fast-growing plant with lot of succulent growth. The crop should be irrigated with plenty of water for its vigorous growth. The critical stages for irrigation in cucumber are blossoming and fruiting. On average, cucumbers need 2.5cm of water a week. During hot, dry weather and during blossoming the cucumber may need 5cm in a week. The beds should be kept free of weeds, especially in the early stages of crop growth. Later on, quickly spreading vines smother the weeds. Staking should be done during the rainy season.

SEED EXTRACTION AND HANDLING

Fully matured fruits at 65 days after anthesis were harvested for seed extraction. The maturity is confirmed by appearance of clear brownish color. The floated immature seeds can be removed from the seed lot. Small fruits having weight of less than 50 g will not choose for seed extraction. The seed maturity can be ensured by opening the fruit longitudinally and easy separation of seeds from flesh. Acidity of the pulp is also considered as maturity index for gynoecious and parthenocarpic varieties. Then seeds are separated manually by scraping or using seed extracting devices (George, 1999). These seeds can be allowed for 24 hours natural fermentation and then cleaned by washing. The round perforated metal sieves with the size of 16/64" or BSS 4 x 4 wire mesh sieves (6.2 mm) can be used to get good quality seeds. For varieties, a quantity of 250 kg seeds can be obtained in one hectare.

SEED STANDARDS AND VIABILITY

Minimum isolation distance of 1000m from other cucurbits is needed for certified seeds and 1500m for foundation seeds. These isolation requirements are not required; if the seeds are produced inside insect-proof structures. The seed will germinate in a week time at 21°C and two weeks at 16°C. The seeds will not germinate in soil where temperatures are below 11°C. The minimum germination percentage should be 60 with the physical purity of 99 per cent.

STORAGE OF SEEDS

Seeds are dried to eight per cent moisture and treated with combination of Carbendazim 50 % WP @ 2 g/kg seed and halogen mixture (Bleaching powder + $CaCO_3$ + *Albizzia amara* leaf powder @ 5:4:1) @ 3 g/kg seed can be stored up to 12 months in normal cloth bags and 24 months in water proof bags.

BIOTECHNOLOGICAL APPROACHES

Haploids were produced by growing of anthers in the media added by 2, 4-D and BA in different combinations through somatic embryogenesis. (Touraev *et al*. 1997; Pechan and Smykal, 2001). Pre-culture of anthers and maturation of somatic embryos were carried out to enhance the performance in two cultivars of *Cucumis* and ploidy level was confirmed. Effect of cold treatment (4°C) and heat shock treatment (32°C) of anthers in cucumber was studied it was observed that 48 hours cold treatment recorded higher levels of somatic embryo induction (Ashok Kumar *et al.* 2003). Same results were observed in cucumber, when anthers were pre-treated with cold water at 4°C for 48 hours. Haploids were successfully generated by growing anthers in growing media added with 2,4-D, BA and NAA after the pretreatment and percentage of embryogenesis was dependent upon genotype, combination and concentrations of growth regulators (Song *et al*. 2007).

CONCLUSION

The cucumber hybrids are developed by hybridizing gynoecious parents with monoecious parents. After removal of male flowers in the female lines, honey bees are involved for pollination. Two to three bee hives can be installed for one hectare area to ensure successful pollination and fruit set. The ratio between female and male lines in the field should be 3:1. The isolation distances of 1000m and 1500m from other cucurbits is needed for certified seeds and

foundation seeds respectively. Haploids were generated by growing of anthers in the media added with 2,4, D and BA in different combinations through somatic embryogenesis.

REFERENCES

Ashok Kumar, H.G., H.N. Murthy, K.Y. Paek, 2003. Embryogenesis and plant regeneration from anther cultures of *Cucumis sativus* L. Scientia Horticulturae, 98: 213–222.

Beyer, E. Jr. 1976. Silver ion: A potent antiethylene agent in cucumber and tomato. *HortSci*. 11: 195-196.

De Candolle, A. 1886. *Origin of Cultivated Plants*. Kegan. Paul. Trench & Co., London.

Deakin, J.R., Bohn, G.W. and Whitaker, T.W. 1971. Interspecific hybridisation in *Cucumis. Econ. Bot*. 25: 195-211.

Esquinas-Alcazar, J.T. and Gullick, P.J. 1983. Genetic resources of Cucurbitacae. International Board for Plant Genetic Resources, Rome.

George, R.A.T. (1999). Vegetable Seed Production. CABI Publishing. 327 p.

Kubicki, D. 1970. Cucumber hybrid seed production based on gynoecious lines multiplied with the aid of complimentary hermaphroditic lines. *Genet. Palanica* 11: 181-186.

Pechan, P.M., Smykal, P., 2001. Androgenesis: affecting the fate of the male gametophyte. Physiol. Plant. 111: 1–8.

Peñaloza, P. 2001. Semillas de Hortalizas, Manual de Producción. Ediciones Universitarias de Valparaíso, Universidad Católica de Valparaíso. 161 p.

Peterson, C.E. and Anhder, L.D. 1960. Induction of staminate flowers on gynoecious cucumbers with gibberllin. *Science* 131: 1673-1674.

Peterson, C.E. and Dezeew, D.J. 1967. The hybrid pickling cucumber. *Spartan Dawn. Quart. Bull. Mich. Agr. Exp. Sta*. 46: 267-273.

Robinson, R.W. 1999. Rationale and methods for producing hybrid cucurbit seed. *Journal of New Seeds*. 1: 1-47.

Song, Hui., Qun-Feng Lou, Xiang-Dong Luo, Joseph N. Wolukau, Wei-Ping Diao, Chun-Tao Qian, Jin-Feng Chen. 2007. Regeneration of doubled haploid plants by androgenesis of cucumber (*Cucumis sativus* L.) Plant Cell Tiss Organ Cult (2007) 90:245–254.

Touraev, A., Vicente, O., Heberle-Bors, E., 1997. Initiation of embryogenesis by stress. Trends Plant Sci. 2**:** 297- 302.