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In Vitro Shoot Multiplication of Garlic (*Allium Sativum* L.)

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Abstract

Shoot apex of Garlic, as explants, was used for experiment of bulb formation and shoot multiplication. $HgCl_2$ (0.1%) as surface sterilizing agent was exposed five and ten minutes time duration. GA_3 were added to MS basal medium and different concentration of full strength MS medium, half strength MS, one fourth MS and three fourth MS were taken to study their response on explants growth and development. In apex explants, best and early response (76%) for bulb formation and multiplication of shoots were observed in half strength MS medium containing 0.1µM GA_3. while in three fourth MS medium without GA_3, the bulb formation was delayed and minimum (60%).

Keywords: Shoot apex, Bulb let, Phytohormone, Garlic and GA_3.

Contents

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1. Introduction

India is called as the Spice country. India is leader in production of cumin, coriander, chilly and garlic. *Allium sativum* L. belongs to a member of the onion family (Alliaceae) and has been used for both culinary and medical purpose. Garlic is a perennial herb with a globosely bulb containing 5-15 cloves, covered by white or mauvetingrd skin. The plant has flat leaves and produces an umbel of green-white to pink flowers, with a deciduous spate, that appear in summer. Extensive research work has been carried out on the health promoting and medicinal properties of garlic. *A. sativum* has shown a variety of biological activities including antioxidant, cancer prevention, liver protection, immunomodulation and reduction of cardiovascular disease risk factors [1-3]. Garlic has an unusually high concentration of sulfur containing compounds. Micropropogation provides a rapid, reliable system for the production of large numbers of genetically identical clones and plantlets. It offers a method to increase valuable genotypes rapidly and expedite the release of improved varieties. The present investigations were carried out to standardize surface sterilization of explants, shoot apex used as an explant for culture establishment, growth regulators for shoot multiplication and rooting, bulb formation and to evaluate suitable hardening media.

2. Materials and Methods

Cloves of healthy garlic were first washed with tap water. Then cloves were placed in bavistin (fungicide) 1gm/L for 20mins.than cloves were five times washed with distilled water. Cloves were peeled off and isolated shoot apices (fig-A and B). The final surface sterilization was done with 0.1% $HgCl_2$ for 5 & 10 min and then washed with sterile distilled water for 3-4 times under the laminar air flow cabinet. Explants were inoculated on MS media [4] and incubated in growth room. Modification to the medium was done by adding growth regulators and other organic additives [5].

The stock solutions were mixed in required proportion along with growth regulator GA_3 and 30 gm/l sucrose. The pH of the medium was adjusted between 5.8 by using either 0.1 N HCl or 0.1N NaOH. The volume was finally adjusted and 8gm/l of agar was weighed and added into the medium and poured into 25 x 150 mm pre sterilized glass culture tubes and plugged with non absorbent cotton caps. The media was autoclaved at 121^0C at 15 lbs/square inch pressure for 20 minutes and then allowed to cool to room temperature and stored in culture rooms until further use.

Sterilized explants were inoculated in test tubes containing the media. Cultures were maintained at 26^0C under 16 h light (3000 lux) in growth room.

3. Result and Discussion

Sterilized shoot apexes were inoculated in different concentration of full strength MS medium, half strength MS, one fourth MS and three fourth MS with and lack of 0.1µM GA_3. Roksana, *et al*. [6] were used BAP, NAA, 2 ip and KIN for shoot apex culture in their study. The earlier bulb formation were observed in haft strength MS medium containing 0.1µM GA_3 (6 days), where as late bulb formation were observed in three fourth MS medium without GA_3. After 20 days of inoculation maximum formation of bulb let and shoot multiplication (76%) was observed in haft strength MS medium with GA_3 and minimum bulb formation (60%) was observed in three fourth MS medium without GA_3 .The percentage formation of bulbs are collected in table-4.1.

Fig- A. Peeled off garlic cloves. B) Garlic Apexes .

Table-4.1. Percentage of In vitro bulb formation and shoot multiplication

	Ex-plants	**MS medium**	**Haft Strength MS medium**	**One fourth MS medium**	**Three fourth MS medium**
0.1µM GA_3	Garlic Apices	62	76	68	62
0.0µM GA_3	Garlic Apices	60	65	66	60

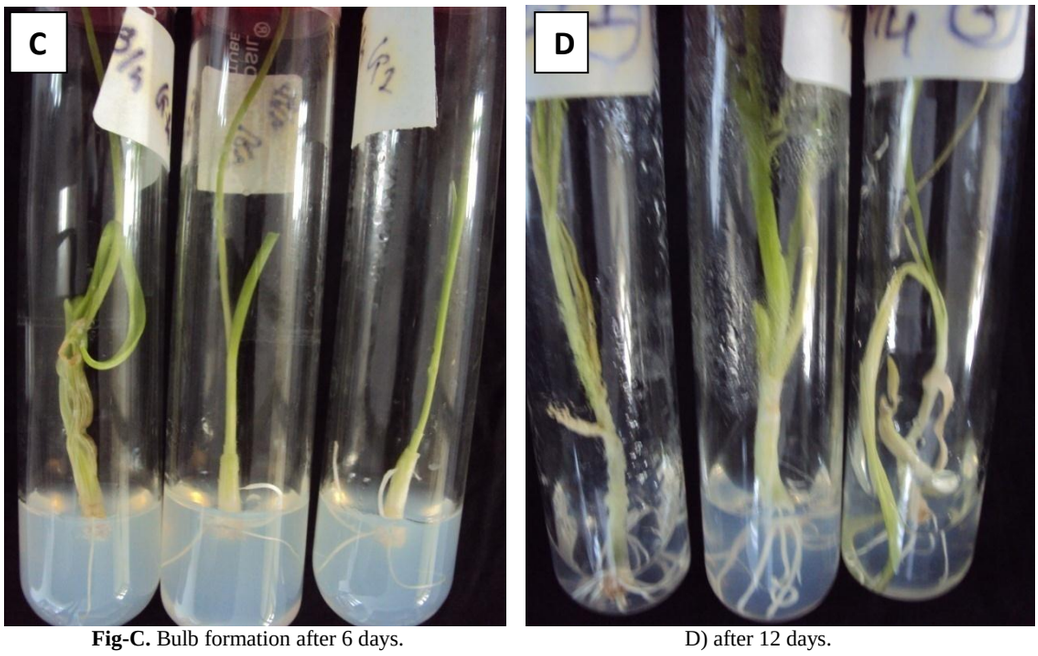

Fig-C. Bulb formation after 6 days. D) after 12 days.

MS medium generally gave better results than B_5 medium in producing bulblets from garlic shoot apex. In shoot apex explants, best and early response (76%) for bulb formation was observed in haft strength MS medium containing 0.1µM GA_3 .While in three fourth MS medium without GA_3, the bulb formation was delayed and minimum (60%). Conventionally the use of seed bulb is the only way for cultivation of garlic. For each plant one seed bulb is needed. The lack of availability of seed bulbs is the limitation for its large scale propagation. To overcome this, micro-propagation may play an important role in rapid mass propagation of garlic. Plants produced through micro-propagation are true to type and are free from diseases.

4. Acknowledgments

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