



Pollination and breeding of eggplants

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Abstract

The purpose of this review article is to provide clear and brief information on pollination and breeding of eggplant to increase yield and improve fruit quality. Considerable progress in artificial pollination and plant breeding techniques have played a very important role in increasing plant, including eggplant, yield and improving fruit quality. With classical methods, homozygous diploid lines can be obtained in 5-8 years depending on the species. In-vitro techniques such as anther and pollen culture have been very successful in shortening the required time for this process. Artificial pollination and proper breeding techniques substantially increase eggplant yield and improve its fruit quality.

Key words: Eggplant, pollination, breeding, yield, fruit quality.

Introduction

The major portion of this review article is extracted from Dris and Pessaraki¹⁰. There is a great deal of information found in the literature on artificial pollination of plants and plant breeding, including eggplant, indicating a substantial increase in eggplant yields. Each of these topics is discussed separately in the following sections.

Eggplant Pollination

Eggplant flowers are self-pollinating. However, pollinators are absolutely necessary for fruit set and seed formation^{6, 20, 23}. One of the major problems in greenhouse fruit vegetable production is insufficient pollination. Due to isolated atmosphere, there is no wind, and pollinators do not enter. On the other hand, in some countries greenhouses are not regularly heated at a level required for optimal plant development; low temperatures and low solar radiation reduce pollen production and high relative humidity restricts pollen dynamism. As pollinators, honeybees are not effective for *Solanaceous* crops^{4,5, 7, 21}. Growers have tried to simulate fruit set in tomatoes and eggplants by using auxins or vibrators, but these techniques are time consuming and not economical. Therefore, bumblebees have been used as pollinators of tomatoes, peppers and eggplants because of their capacity to forage at low temperatures and low light intensities in greenhouses in many countries such as the Netherlands, Belgium, France, Israel, etc. Since 1988, besides improvements in bumblebee pollination, rearing techniques have contributed to their use for pollination of greenhouse tomatoes, eggplants, and melons^{3,8,24}. In Mediterranean countries greenhouses are not regularly heated and pollen production and quality are decreased by low temperatures. Abak and Güler^{1,2} reported that pollen amount and fertility of greenhouse eggplants are generally lower in winter, but if the effective pollinators, like bumblebees, used the limited amount of good qualified

pollen, hybrid cultivars would be able to set fruits. On these grounds, the study conducted by Abak et al.³ during 1994-1998 was aimed at determining the effectiveness of bumblebees as pollinator for eggplants grown in unheated greenhouses. Germination capability of viable pollen is directly related to the amount of nutrients in the germination medium and with the environmental conditions¹⁴. The optimum germination medium is variable, depending on plant species and, sometimes, varieties. Besides the amount of nutrients in the medium, the medium's humidity^{11,19}, temperature^{9, 13, 15, 19, 25,26}, air pressure, and pH^{12,18} also affect the *in-vitro* pollen germination. If any of these conditions is inadequate, the pollen cannot germinate even if it has high viability. Information on the determination of pollen fertility of eggplant genotypes *in-vitro* techniques is not found in literature. In a previous study², besides TTC pollen staining tests on several eggplant varieties, it was observed that *in-vitro* germination percentages of eggplant pollen were low. Therefore, another study was conducted¹⁶ to investigate the suitable germination method and media as well as critical incubation time for *in-vitro* germination tests of eggplant pollen. Viability and germination abilities of 11 eggplant F1 hybrids grown in a glasshouse were also tested.

Breeding in Eggplants

Considerable progress has been achieved in plant breeding in which *in-vitro* methods have played a very important role. With classical methods, homozygous diploid lines can be obtained in 5-8 years depending on the species. *In-vitro* techniques such as anther and pollen culture have been very successful in shortening the required time for this process. As a result, F1 hybrid production can be obtained by saving time and labor. *In-vitro* and progenesis have been reported in several species.

However, Gulshan et al¹⁷ reported that the callus induction from cultured anthers could be formed, but the shoot differentiation was not produced, in tomato. In the study by Özzambak and Atasayar²² tomato and oval eggplant cultivars were used to establish haploid and later homozygous diploid lines via anther culture, which should provide efficient material for further studies on F1 hybrid production.

Summary and Conclusions

This article presents brief most recent information on the pollination and breeding of eggplant to increase yield and improve fruit quality. Although eggplant flowers are self-pollinating, pollinators are absolutely necessary for fruit set and seed formation. The article provides information on the use of bumblebees as pollinators of tomatoes, peppers and eggplants in greenhouses. Environmental factors (temperature, light, relative humidity) affecting pollination are discussed in this article. Considerable progress has been achieved in plant breeding in which *in-vitro* methods have played a very important role. With classical methods, homozygous diploid lines can be obtained in 5-8 years depending on the species. *In-vitro* techniques such as anther and pollen culture have been very successful in shortening the required time for this process. As a result, F1 hybrid production can be obtained by saving time and labor. General conclusion drawn from various studies reviewed here indicated that optimum and proper pollination and breeding techniques substantially increased eggplant yield and improved the fruit quality.

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