Effect of grafting on yield and quality of eggplant

Environment, Plants

Graft of susceptible fruiting vegetables by using resistant rootstocks is one of the most effective approaches for increasing plant disease resistance, yield and fruit quality. In this concern, many investigators pointed out that grafting the susceptible varieties onto the resistant rootstocks can be used instead of chemicals, especially soil fumigations, for protection against soil borne pathogens. Also, Liu and Zhou (2009) reported that Eggplant grafted onto tomato rootstock was more resistance to infection by the fungus Verticillium dahliae than the nongrafted eggplants. The resistance developed in the grafted plants may be attributed to the innate resistance of the rootstocks and improved plant nutrient uptake which improves disease control in the grafted plants.

On the other hand, eggplant S. melongena cv. California scion grafted onto any of the tested rootstocks significantly reduced the harmful effect caused by the tested mite. This result is in harmony with those obtained by Cortez-Madrigal (2012) who reported that grafted tomatoes were less liable to attack with tomato psyllid than the non-grafted plants.

On the other hand, the present study proved that the rootstocks may have a positive effect on the plant vigor, yield and fruit quality. In this regard, plant height, was higher in plants grafted onto S. torvum rootstock and lower in plants grafted onto L. esculentum cv. Super strain-VFN rootstock. The higher yields in grafted plant may be contributed to improved plant nutrient uptake and water absorption.

In respect to the fruit quality, this work showed that rootstocks may affect the fruit shape characteristics such as fruit length, fruit width and fruit

diameter. These results are in harmony with those obtained by Gisbert et al. (2011) who reported that the use of interspecific hybrid rootstocks developed from perfectly compatible crosses of eggplant with related species can be a promise approach to improve eggplant production. The change of the fruit shape may be contributed to the changes occurred in the concentration of growth regulators induced by the rootstock. Also, Maršič et al. (2014) and Sabatino et al. (2016) found that grafted plants consistently produced more fruits per plant than ungrafted ones. Sabatino et al. (2016) found that grafted plants significantly increased the total and marketable yield production without negatively affecting the average of fruit weight and waste production. Also, Moncada et al. (2013) reported increment in the size of the grafted eggplant fruits. Moreover, this study showed that grafting exerted no significant differences in ascorbic acid content among the grafted and the ungrafted plants during the two seasons. In this regard, Zhang (2004) reported that the levels of dry matter, protein, vitamin C and sugar of grafted eggplant were higher than those of non-grafted eggplant.

Graft compatibility means firming a successful graft union as well as prolonging the performance and the survival of the grafted plant composite. In this study, high grafted compatibility due to the successful growth was observed only when scion tested was grafted onto S. torvum rootstock. This is may be due to the same construction of the scion and rootstock. Similarly, Goldschmidt, (2014) stated that the taxonomic consanguinity is a prerequisite for graft compatibility.

Many reports suggested that grafting could change the plant physiology. In this concern root volume, root vigor increasing and releasing oxygen ability of chloroplast were enhanced by grafting eggplant onto wild eggplant rootstock. In this study, the activities of peroxidase (POX), total phenols and total flavonoids which are closely related to plant disease resistance were increased in the grafted eggplant than in non-grafted. These results are in agreement with those obtained by Na et al. (2012) who found that grafted eggplant had higher root active absorbing area, chlorophyll content peroxidase and phenylalaninamonilays activities than non-grafted eggplant. Peroxidase oxidizes the phenolic compounds to toxic compounds namely quinines. Also, lead to release of highly reactive free radicals and increase the accumulation of lignin and suberin in cell walls and papillae, thus act as a barrier against pathogen invasion.

The role of phenolic and flavonoid compounds in confronting the pathogens and pests was well documented by many authors. This role may be attributed to their toxic effect on the pathogens and herbivores. Moreover, phenols are the main cursor of lignin synthesis, which act as a barrier to prevent the further progression of the pathogen to penetrate into cells or herbivore to feed. In addition to that, flavonoids are inhibiting the pathogen’s enzymes by chelating the metals, influencing the behavior, growth and development of insects and scavenging the reactive oxygen species (ROS). In general, an increased synthesis and accumulation of phenols and flavanols in plant tissues could be linked to their higher resistance to pathogens and herbivores. The results obtained by Prats et al. (2003) showed that accumulation of phenolic compounds in sunflower plants was closely related

to compete of S. sclerotiorum. Also, they stated that the phenolic compounds were accumulated in resistant varieties more than in susceptible varieties. Also, Mutthuraju (2013) found an increase in total phenolic contents in brinjal wild types (S. torvum) that showed resistance to the mite. The results obtained by Slatnar et al. (2016) reported a higher content of flavanols in plant tissue triggered by different pathogen infections.

Conclusion

These results suggest that grafting onto S. torvum rootstock might represent a potential tool for controlling white rot disease caused by Sclerotinia sclerotiorum as well as spider mite on eggplant and increasing its yield and fruit quality.