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Tomato Grafting for Low-Resource Open-Field Tomato Production in Tanzania

Abstract

Tomato is among the most important vegetables grown in Tanzania. However, production is strongly challenged by abiotic and biotic factors. Vegetable grafting has been used as an effective tool to combat abiotic and biotic factors while improving yield and quality. Yet, in Tanzania this is still a new technology, which needs to be explored in depth in order to be utilized effectively. The aim of this study was to evaluate the utility of grafting for improving yield and quality of tomato in Morogoro, Tanzania. The specific objectives were to: 1) evaluate grafting compatibility between tomato cultivars of commercial importance in Tanzania and the tomato germplasm line Hawaii 7996 and eggplant germplasm line EG195, 2) assess the effect of grafting with EG195 rootstock on plant growth and vigor of tomato cv. Tengeru97, 3) determine the effect on weed suppression of grafting 'Tengeru97' onto EG195; and 4) evaluate the effect of grafting with EG195 rootstock on yield and fruit quality of 'Tengeru97' tomato. Since low-resource farmers are unlikely to have access to sophisticated grafting facilities such as cooled healing chambers with humidifiers, the focus of the first series of experiments was to evaluate grafting success when graft healing was conducted in three locations. Although, graft healing was not successful in a shaded area outdoors, some grafting success was obtained indoors in a healing room, and even higher survival of grafted seedlings occurred when grafted plants were placed in a healing chamber within the healing room. Grafted seedling survival was higher with EG195 eggplant rootstock than with Hawaii 7996 tomato rootstock when the seedlings were grafted at three weeks old at temperature and relative humidity ranges of 20-27° C and 86-100 %, respectively. In two field trials at the Horticulture Unit of the Sokoine University of Agriculture, nongrafted 'Tengeru97' tomato plants and 'Tengeru97' grafted onto EG195 eggplant were compared for their plant growth and vigor, weed suppression, fruit yield, and fruit quality. Nongrafted tomato plants were 5.7 cm taller in trial 1 and 10 cm taller in trial 2 than grafted plants, but no difference in dry plant biomass occurred in either experiment. Nongrafted plants flowered two days earlier than grafted plants in the first field experiment but flowering date did not differ in the second field experiment. There was no significant difference in the broadleaf, grass, and sedge weed biomass in response to grafting in either trial. However, sedge density was higher with the grafted tomato treatment than with the nongrafted treatment in trial 1 and the grafted treatment had a higher density of grass weeds than the nongrafted treatment. Total and marketable yields were higher from the grafted tomato plants than the nongrafted plants in trial 1, which was conducted during the rainy season. In contrast, the response was reversed during the dry season, so that, lower total and marketable yields resulted with the grafted treatment. Even though the nongrafted and grafted plants did not demonstrate consistent differences in fruit quality attributes measured in this study, fruits from grafted plants were firmer than fruits from nongrafted plants in both experiments. The results indicate that grafting is possible under low- resource conditions in Tanzania and that further work is warranted to confirm the utility of grafted tomato plants for open-field production in Tanzania.