A simple procedure and the genetic potential for rooting of stem cuttings in muskmelon.

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Annual crops in which fruits are the important economic product offer particular challenges to the plant breeder for selection and generation advance. At the point that fruit evaluations have been completed and superior plants selected for advancement, plant condition and/or duration of growing season may not permit additional controlled pollinations and seed collection. Where disease reaction is one objective of the program, the introduction of disease into the field planting may disrupt normal expression and genetic distribution of horticultural traits. It would be an advantage to conduct multiple evaluations on the plants without jeopardizing either the plant or the environment. This report presents our results of runner tip propagation of muskmelon to provide plants for evalution of horticultural traits as well as virus testing and selected seed production.

Initially, we were interested in propagation of zucchini yellow mosaic virus (ZYMV)-resistant selections of PI 414723 in the greenhouse for seed increase and crossing studies (3). Vigorous tips with 4 to 5 nodes were prepared for rooting by removal of leaves from the two subterminal nodes and immersing the cuttings into perlite in 5 x 5 x 10 cm plastic rose pots. These cuttings were then maintained under high relative humidity and intermittent mist until roots had developed, generally at the wound tip or buried nodes. Rooting occurred rapidly in this material. Rooted cuttings were successfully transplanted to soil and could be carried to maturity without difficulty. This procedure compares favorably with the method described in cucumber (4) and is considerably less complicated than the aerated nutrient solution technique described in muskmelon by Foster (1, 2).

We applied this simple perlite rooting technique to several generations derived from a cross of ZYMV-resistant PI 414723 by commercial cv. 'Topmark.' Runner tips were collected from 48-day-old field-grown plants. Flats containing perlite-filled rose pots were carried into the field, and cuttings were inserted directly into the dampened perlite. Cuttings were transported frequently to the greenhouse to prevent excessive wilting. The pots were placed onto a bench enclosed on all sides with plastic sheeting. Overhead mist emitters positioned approximately 1 m above the bench were set to mist 5 seconds each 15 minutes, initially, but were adjusted to each 30 minutes after 2 days. A second group of cuttings from only the parental lines (PI and Topmark) was collected after 67 days of growth.

Results of root development on cuttings from the various breeding populations (Table 1) indicate a high rate of success. The PI parent and generations with a high proportion of PI germplasm rooted more readily than did Topmark and its backcross generation. At 21 days, all populations except Topmark recorded a high percentage of rooting. It is interesting to note the percentage of viable growing tips available in rooted cuttings from the various populations. The growing points on certain cuttings failed to continue growth and eventually died. These cuttings, although they rooted satisfactorily, failed to establish a viable plant. Failure of growing points to survive may have been due to desiccation either during the period after harvest of the cutting until placement under the mist system or during the interval under the mist before roots formed to provide adequate moisture to the growing point. Again, populations derived from the PI parent provided the greater potential for viable plants from the rooted cuttings.

Rootings on cuttings from the two parent materials taken at 67 day growth was quantitied by numerical ratings for the expression of various traits (Table 2). In each category, rooting of the PI parent was superior to the cv. Topmark. Examples of these differences are evident for rooting characteristics of cuttings of the two genotypes in Figure 1.

These data demonstrate the existence of genetic differences for rooting potential between the two parents and a strong pattern of inheritance from PI 414723 to the filial and backcross progenies.

In the perlite rooting medium, no soft rot or other microbial damage to cuttings was observed. Wound surfaces quickly formed callus with eventual initiation of roots from these callus cells. Therefore, we feel there is no necessity to treat cuttings after harvest with antimicrobial materials. This no doubt relates to the very porous nature of the perlite rooting medium. Similarly, we experienced no difficulty in transferring cuttings from perlite into greenhouse soil after rooting occurred. Cuttings transferred to 12.5 cm square plastic pots continued growth without disruption, and resultant plants could easily be maintained to flowering and fruit maturity in the greenhouse.

In a limited study, indolbutyric acid (IBA) either as an 100 ppm solution or as 0.5% dry powder in talc increased rooting frequency and root length on stem tip cuttings compared to controls. An additional advantage of IBA treatment was the formation of roots from cells in the internodal regions as well as from nodes and wound callus.

This propagation procedure has enabled us to reproduce the plants from the field into a duplicate set of greenhouse plants. The field plants were evaluated for horticultural genetic traits and for fruit harvests, while the greenhouse plants were inoculated with ZYMV to provide inheritance data and breeding progress for this virus. Virus-resistant or symptomless plants in the greenhouse, which derived from field plants exhibiting favorable horticultural traits, were used for selected pollinations to provide selfed and crossed seed for next generation evaluations.

Table 1. Rooting of muskmelon stem tips from 48-day-old field-grown plants.

Population	Cuttings rooted after ___ days [z] 7	14	21	Percent cuttings transplanted (21 days)	Percent cuttings with viable growing tips
Topmark	1	12	27	66	43
PI 414723	17	33	35	94	92
F_1	11	31	35	97	96
F_2	15	31	35	98	91
BC_{TM}	10	29	34	96	78
BC_{PI}	16	32	34	96	96

[z] Data adjusted to 36 plant populations. Actual populations were: parents, 36; F_1, 72; F_2, 144; BC's, 72.

Table 2. Rooting of muskmelon stem tips from 67-day-old field-grown plants.

Population	Rooting position[z]	Root frequency[y]	Avg. root length (cm)	Avg. top growth[x]	Survival potential %
Topmark	T	3.3	6.5	2.5	72
PI 414723	T,N	3.7	8.5	3.4	92

[z] T = wound tip; N = node

[y] Root frequency - average value calculated from: 1 = single root; 2 = double root; 3 = few roots; 4 = multiple roots.

[z] Top growth - average value calculated from ratings: 1 = none; 2 = slight; 3 = moderate; 4 = extensive growth.

Literature Cited

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Figure 1: Topmark and PI 414723 cuttings rooted 21 days in perlite under intermittent mist.