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Reviewed Research Paper

In Vitro Propagation of Peach: II. A Medium for *In Vitro* Multiplication of 56 Peach Cultivars[1]

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Abstract

A medium was developed which supported shoot growth and multiplication of 56 peach and nectarine cultivars. Explants were taken from mature trees. A significant level of multiplication (5x) and a high level of culture survival (90%) was observed.

Introduction

There are several reports of the *in vitro* propagation of peach (1, 3-9). However, only one cultivar was tested in each of these studies with the exception of Hammerschlag (3) and Martin et al. (4) where 11 and 3 cultivars were tested, respectively. A genotype x culture medium interaction has been demonstrated (3). The advantages of propagating a variety of genotypes without extensive media modification is self evident. Clonal propagation through the use of shoot cultures may be more rapidly applied to problems of multiplication, maintenance and shipment of disease free cultivars.

Plant materials collected from juvenile plants have been reported to be more amenable for *in vitro* propagation than explants taken from mature trees (2). However, propagation of plantlets from mature plants is desirable since genotypes evaluated for traits such as self fertility or fruit quality may be clonally propagated and maintained in a disease free condition. Therefore, the *in vitro* response of explants taken from mature plants cultured on AP medium was investigated

Materials and Methods

This study reports the *in vitro* shoot growth and multiplication of 56 peach and nectarine cultivars (genotypes) on AP medium (reported in the preceding paper). Shoot apices excised from field grown adult trees of 56 peach and nectarine cultivars were obtained from 14 year old certified disease tested plants (Foundation Seed and Plant Materials Service, U. C. Davis). The explants were cultured on AP shoot multiplication medium (preceding paper) containing 26.7+M (6mg l^{-1}) N^6-benztladenine (BA) plus 0.04+M (0.01-l^{-1}) @-indolebutyric acid (IBA).

Procedures for excision and disinfection of explants, composition and sterilization of the medium (AP), and environmental conditions for incubation of cultures are provided in the preceding paper. One 0.5 cm long explant was used per culture vessel in all of the experiments conducted. Eight replications per cultivar were used to test cultivar growth on AP medium. Growth measurements consisted of fresh weight, number of leaves, length, of shoots, and number of axillary

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shoots. Number of surviving cultures (i.e., cultures with live and green shoots) were also recorded at 5 weeks.

Results and Discussion

AP shoot multiplication media supported growth of all of the tested cultivars (Table 1). The mean percentage of explant survival for all cultivars was 90%. AP shoot multiplication medium also produced excellent shoot multiplication of most cultivars with a mean of 5.1 explants per initial shoot for all cultivars. The explants grew vigorously during the entire culture period of 5 weeks as indicated by the high levels of accumulated fresh weight, no. of leaves, and shoot length.

This study has demonstrated and confirmed a previous report (3) of a strong genotype dependent response for peach cultivars with respect to culture media. This may be due to different hormone level requirements for each cultivar. Some cultivars may have a larger requirement for endogenous hormones, less efficient hormone uptake in culture, or different levels of endogenous hormone production in culture. The results indicate that it is unlikely that a single medium can be developed that will provide optimum performance for all commercial cultivars. However, this test of 56 cultivars has demonstrated that most of the cultivars can be grown and multiplied successfully on the AP medium. This can be seen from the nonsignificant value of Chi square for number of surviving cultures and the substantial multiplication observed for most cultivars (Table 1). Given the number of cultivars that can be successfully cultured on this medium, it is reasonable to expect that the medium could be successfully used to maintain or propagate shoot tips of many other untested genotypes without additional media modification. Therefore, this medium, along with the procedures described in the companion paper, permit the application of shoot tip culture to the clonal multiplication and disease free maintenance of peach cultivars.

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Table 1. Performance of 56 peach and nectarine cultivars after 5 weeks on AP medium. N = Nectarine.

Cultivar	Fresh weight (mg)	No. of leaves	Shoot length (mm)	No. of shoots	No. of surviving cultures
Andross	2,217	28.9	18.8	6.0	8.0
Greening	2,167	29.1	19.0	6.1	8.0
Early Coronet	2,159	29.8	19.1	6.1	8.0
Springcrest	2,141	33.1	18.6	7.4	8.0
Elberta	2,051	32.8	18.8	6.9	8.0
LaRed	2,046	33.3	19.0	7.1	8.0
Regina	2,037	32.5	18.8	6.9	8.0
Stanwick (N)	1,956	44.4	19.1	9.3	8.0
Delp Hale	1,945	33.3	18.9	7.1	8.0
Pacifica	1,766	44.5	18.1	8.9	8.0
Redglobe	1,766	25.5	18.3	5.1	8.0
Bowen	1,759	25.8	18.4	5.1	7.0
Maygold	1,716	28.8	18.0	6.0	8.0
Fairlane (N)	1,642	28.9	16.9	5.9	8.0
Tiger	1,637	28.4	16.9	6.1	6.0
Filte	1,553	50.1	17.1	9.9	7.0
Ranger	1,557	20.6	17.1	4.0	8.0
Quetta (N)	1,545	28.1	17.3	6.0	8.0
Tufts	1,523	29.3	17.1	6.0	8.0
Fairtime	1,481	44.8	17.0	8.8	8.0
49'er	1,461	30.1	17.1	6.0	8.0
Springold	1,449	28.5	17.1	6.1	8.0
Desertgold	1,442	32.5	17.3	7.0	8.0
Royal Fay	1,442	28.5	17.0	6.0	8.0
Firebrite (N)	1,378	33.8	15.6	6.6	8.0
Lovell	1,367	38.5	14.6	8.6	8.0
O'Henry	1,366	25.5	15.9	4.9	8.0
Halford	1,355	28.5	15.8	6.1	8.0
Dixon I	1,346	28.5	17.3	5.9	8.0
Coronet	1,220	25.4	16.0	5.1	8.0
Flavortop (N)	1,168	40.0	15.3	7.9	7.0
Merriam	1,160	33.9	15.0	6.8	6.0
Gaume	1,121	25.0	15.1	5.1	7.0
Flamecrest	1,079	25.4	15.0	5.0	8.0
Summerest	1,050	15.1	19.1	2.9	8.0
Cardinal	1,048	20.0	15.0	4.0	6.0
Nemaguard	1,038	25.8	15.0	5.0	7.0
Sun Grand (N)	1,030	15.0	14.9	2.9	6.0
Cortez	950	15.5	15.4	3.1	7.0
Springtime	950	20.8	14.9	4.1	6.0
Redtop	945	14.8	15.5	3.3	8.0
Royal May	942	10.5	15.1	2.1	7.0
Redgrand	914	25.4	15.1	5.1	7.0
Carolyn	910	10.4	15.4	2.0	8.0
June Lady	858	5.0	13.6	1.3	5.0
Flamekist (N)	858	15.1	14.1	3.1	7.0

Table 1. (Cont.) Performance of 56 peach and nectarine cultivars after 5 weeks on AP medium. N = Nectarine.

Cultivar	Fresh weight (mg)	No. of leaves	Shoot length (mm)	No. of shoots	No. of surviving cultures
Early Sungrand (N)	847	14.5	14.1	3.0	6.0
Independence (N)	824	18.6	14.0	3.6	8.0
Suncrest	797	10.6	13.9	1.9	6.0
Fortuna	748	11.0	14.4	1.9	6.0
J. H. Hale	746	20.3	14.4	4.1	8.0
Late Le Grande (N)	739	14.5	13.6	3.3	6.0
Madelie	658	10.3	13.8	1.8	6.0
Redhaven	621	15.1	13.6	3.1	7.0
John Rivers (N)	608	10.1	14.1	1.9	6.0
Walgant	530	14.8	12.9	2.9	6.0
Treatment means	1,315	25.2	16.2	5.1	7.2
LSD (5%)[x]	235	5.2	1.7	1.4	
X^{2y}me					12.4

[x]Least significant difference ($P < 0.05$).
[y]Chi-square ($P > 0.95$).

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Cytoplasms of Highbush Blueberry Cultivars[1]

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Abstract

The cytoplasms of 50 highbush cultivars were determined by following published pedigrees back to the original parent. Only 4 cytoplasms were located (Florida 4B, North Sedgwick, Brooks and Rubel) and 2 of them were represented by a single cultivar (Florida 4B and North Sedgwick).

Introduction

The pedigrees of 63 tetraploid highbush blueberry cultivars were recently gathered and their inbreeding coefficients were calculated (4). It was found that there has been an increase in the inbreeding coefficients among the cultivars released over the last 60 years and most of the nuclear genes in our present day cultivars were contributed by the 3 native selections 'Brooks,' 'Sooy,' and 'Rubel.' This may have slowed breeding progress since reductions in fruit weight and vigor have been described in highly inbred blueberry material (5).

We have now determined the cytoplasms of 50 hybrid cultivars by following published pedigrees back to the original maternal parent (2, 6). The cytoplasm of a seed embryo is usually contributed by the egg of the maternal parent during fertilization. It was assumed that all breeders use the convention of listing the maternal parent first in their inbreeding records.

Table 1 lists the cytoplasms of the cultivars released by public agencies. Wild selections are not listed unless they were a cytoplasm donor. In

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