Table 4. Titratable acidity and total soluble solids of F_2 and "backcross" populations with acidless pummelo as a grandparent.

Location & (season)	Cross	Trees sampled (no.)	Distribution: Samples with % acidity 0.1	0.4	0.5-0.9	1.0-1.6	>1.6	Total soluble solids (%) Mean	Range
Tustin[z] (1969, 1970, 1975)	(Acidless pummelo × Kinnow) selfed	40[y]	12	0	4	16	8	10.9	8.9-14.4
Riverside (1975)	(Acidless pummelo × Frua) × Clementine	27	0	4	10	12	1	11.9	9.1-14.2
Riverside (1975)	(Acidless pummelo × Dweet) × Frua	15	0	0	4	8	3	10.1	8.5-13.1

[z]One sampling was made each year.
[y]Data are for 40 different trees sampled in 1 or more years.

has consistently produced acid fruit at Riverside, while a sister progeny tree has remained acidless (J. W. Cameron, unpublished). This behavior is also suggestive of chimerism. Inheritance involving a cytoplasmic factor for acidlessness appears unlikely in the pummelo, since it was used as seed parent in some crosses and as a pollen parent in others. However, the acidless orange was always used as a pollen parent, so that the possibility of cytoplasmic involvement is not ruled out. The general absence of correlation between acid levels and solid levels found here extends the evidence that these 2 groups of compounds are inherited essentially independently.

Our progenies with acidless pummelo have included numerous individuals with good characters, including large size, earliness, and good flavor. The present crosses with 'Wilking' in addition to the 'Chandler' released in 1961 (1) have been outstanding, as are certain early-maturing triploid hybrids.

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J. Amer. Soc. Hort. Sci. 102(2):201–203. 1977.

Variations in Susceptibility of Apple Stems to Attack by Pine Voles[1]

R. E. Byers[2]
Department of Horticulture, Virginia Polytechnic Institute and State University, Winchester Fruit Research Laboratory, Winchester, VA 22601
James N. Cummins[3]
New York State Agricultural Experiment Station, Cornell University, Geneva, NY 14456

Additional index words. mice, rootstocks, feeding, *Microtus*, damage

Abstract. **Caged feeding tests of 77 *Malus* clones, representing 15 species and hybrid species, revealed 9 cultivars apparently less susceptible to feeding by pine voles than 'Golden Delicious'. *Malus* X *sublobata* PI 286613 shoots were attacked least; other cultivars of special promise include 'Charlotte', 'Hucker No. 1', 'N.Y. 11928', 'Robusta 5', 'Sissipuk', and 'Ivory's Double Vigour'.**

Apple cultivars on seedling rootstocks and on some clonal rootstocks have been reported to vary in susceptibility to vole injury (4, 8). Many fruit growers in the eastern USA have observed that 'Delicious' and 'Golden Delicious' trees are very susceptible to pine vole injury and 'Stayman' trees are much more resistant. Toenjes (8) reported that 'Virginia Crab' was less susceptible than other clones when compared in a group test of *Microtus pennsylvanicus* Ord in outside mulched plot areas. Cummins (4) characterized 'Hibernal' rootstocks as very attractive to meadow voles.

Rootstock resistance to vole attack could greatly reduce the annual labor, chemical and equipment costs for cultural and/or toxicant vole control methods (1, 2, 5, 6, 7). We examined 77 clones in 1974-76 to identify resistant taxons which could be used as parents in breeding improved rootstocks. We also sought preliminary information on transmission of vole resistance to seedlings.

[1]Received for publication September 20, 1976. Grateful acknowledgement is made to Dr. R. H. Myers for analyses of data.
[2]Associate Professor of Horticulture.
[3]Associate Professor of Pomology.

Materials and Methods

Most of the plant material in these experiments was collected

Table 1. Damage to apple and peach stem tissue by pine voles in 24-hr cage trials, using 'Golden Delicious' apple stems as standards in paired comparisons.

	Probability that cultivar tested was less susceptible than 'Golden Delicious' (Prob >F)		
	1974	1975	1976
Prunus persica (L.) Batsch			
Glohaven	.0001**	.0009**	.0255*
	.0003**	.0001**	.0007**
		.0001**	.0000**
Malus domestica Borkh. (Fruiting cvs.)			
Chestnut		.6836 ns	
Delicious			.7037ns
Golden Delicious		1.0000 ns	.5384 ns
		.5521 ns	.5233 ns
		.0841 ns	
Grimes Golden			.1108 ns
Jonathan			.0323 +
Lodi			.1108 ns
McIntosh			.6839 ns
Stayman			.3954 ns
Summer Rambo			.0574 ns
Winesap			.1261 ns
Wolf River			1.0000 ns
York Imperial			.8640 ns
(Rootstock cvs.)			
Antonovka (Traas strain)	.8735 ns		
Ivory's Double Vigour	.0027**	.1304 ns	.0107*
		1.0000 ns	
Kansas 14 (K-14)	.1617 ns		
Malling 25 (M 25)	.7052 ns		
Merton Immune 793 (MI.793)	.4123 ns		
Rotyp	.0648 ns		
Sokeri Miron	.2599 ns		
Malus X*adstringens* Zabel. (=*M pumila* x *M. baccata* (L.) Borkh.)			
Hopa	.1619 ns		
Nippissing		.0140*	.8432 ns
Pink Beauty		.6426 ns	
PK-14 (P.I. 274840)	.2257 ns		
Sissipuk		.0050**	.0001**
Transcendent		1.0000 ns	
Wabiskaw		.1423 ns	
Malus baccata (L.) Borkh.			
Large Yellow Siberian	.1191 ns	.1252 ns	
M. baccata mandschurica (Maxim.) Schneid.		5402 ns	
Malus coronaria (L.) Mill.			
Charlotte		.0001**	.0001**
Malus halliana Koehne			
Hanakaido		.1353 ns	.0008**
Malus X*heterophylla* Spach (=*M. coronaria* x *M. pumila*)			
Redflesh		.6278 ns	
Malus ioensis (Wood) Britt			
Hucker No. 1		.0439*	.0635 ns
plena	.5248 ns		
Prairie Rose		.4966 ns	
Malus X*purpurea* (Barbier) Rehd. (=*M. pumila niedzwetzkyana* (Dieck) Schneid. x *M.* X *atrosanguinea* (Spaeth) Schneid. (=*M. halliana* x *M. sieboldii* Rehd.))			
N.Y. 11928		.0414*	.0114*
Malus x *robusta* (Carr.) Rehd. (=*M. baccata* x *M. prunifolia* (Willd.) Borkh.)			
No. 5 (R5)	.0381*	.0342*	.2751 ns
		.1576 ns	
Malus sieboldii zumi (Matsum.) Asami			
Calocarpa		.6497 ns	
Malus sikkimensis (Hook. f.) Koehne			
		.1705 ns	
Malus X*sublobata* (Dipp.) Rehd. (=*M. prunifolia* x *M. sieboldii*)			
PI 286613	.0003**	.0206*	.0006**
Malus yunnanensis (French.) Schneid.			
Vilmorin		.0563 ns	.0000**
Cvs. of complex or obscure origin			
Arrow (*M. pumila niedzwetzkyana* open-pollinated (OP))		.0295*	.1232 ns
Beauty (*M.* X*robusta* OP)		.7651 ns	
Cranberry (Redflesh x Dolgo)		.1648 ns	
Dolgo (*M.* X*robusta* OP)	.0724 ns	.0875 ns	.3746 ns
Golden Hornet (*M. sieboldii zumi calocarpa* OP)		.4793 ns	
Kensib (Kentucky Mammoth x Dolgo)	.0012**	1.0000 ns	.0017**
N.Y. 11894 (*M.* X*arnoldiana* x *M. pumila niedzwetzkyana*)		.1834 ns	
N.Y. 11902 (*M.* X*arnoldiana* x *M. spectabilis* (Ait.) Borkh.))	.0674 ns	.0674 ns	.0170*
Virginia Crab			.5490 ns
			.8432 ns
Ottawa clonal rootstocks	.0521 ns		
O4	.0521 ns		
O5 (*M. baccata* OP)	.0089**		
O8 (*M. baccata gracilis* x Malling 7)	.0967 ns		.3374 ns
O8 (2 yr old)			.0009**
O11 (*M. baccata* OP)	1.0000 ns		
O12 (*M.* X*adstringens* 'Robin' x Malling 9)	.6444 ns		
Czechoslovakian clonal rootstocks			
T2/II	.3769 ns		
T3/II	.6561 ns		
T6/II	.0064**		
T20/IX	.6356 ns		
T47/IX	.6980 ns		
T51/I	.2836 ns		
T60/I	.0252*		
T81/IX	.4243 ns		
Vineland rootstock selections from open-pollinated R5 seedlings			
VR 36		.7605 ns	
VR 44		.1039 ns	.0001**
VR 49		.4664 ns	
VR 52		.1845 ns	.1026 ns
VR 54		.0027**	.0806 ns
VR 64		.2188 ns	
VR 75		.4655 ns	
VR 77		.1493 ns	
Selections from Malling 9 x PI 286613 family			
70M963-1		.0549 ns	
70M963-2			.0001**
70M963-30			.0001**
70M963-37		.5665 ns	.0025**
70M963-38		.4912 ns	.0046**
70M963-38		.8399 ns	.0041**
70M963-40		.0025**	.0460*
70M963-45			.0023**
70M963-47			.0083**
70M963-49		.0609 ns	

*, **Plant material was less susceptible to pine vole attack in comparison with Golden Delicious. t-test at the 5% and 1% probability levels, respectively.

+Plant material more susceptible to pine vole attack in comparison with Golden Delicious, t-test at 5% probability.

at Geneva while fully dormant in Jan., shipped to Winchester and there compared to dormant scions collected locally from 'Golden Delicious'/'Malling Merton 106' trees.

Adult pine voles caught from orchards in the vicinity of Winchester were placed singly in standard laboratory cages with 7 mm stainless steel wire bottoms. Animals were offered water and commercial rat food continuously throughout all experiments. Each cage was fitted with a metal partition to separate the bedding and feeding areas. Burlap strips were provided for bedding. The animal room was kept on a 16-hr day, 8-hr night, $20^{\circ} \pm 2^{\circ}C$, and a relative humidity of 50 ± 10%.

Each singly caged vole represented 1 replicate. Two stems of a rootstock or other candidate were challenged with 2 'Golden Delicious' stems in each of 24 cages (24 replicates). Stems were placed vertically in the cage with the lower part in about 1.5 cm of water. All stems were about 7 mm diam and 15–17 cm long taken from 1-year-old growth. About 13 cm of each stem remained inside the cage. After 24 hr the stem pieces were removed and rated as follows: 0 = no damage; 1 = less than ½ girdled; 2 = ½ girdled or more; 3 = completely girdled; and 4 = cut into at least two pieces. The damage rating of the two stem pieces of each rootstock was averaged and a t-test was performed on each clone vs. 'Golden Delicious'. Paired comparisons between clones were not performed so those listed in Table 1 cannot be compared directly.

Results and Discussion

Since peach scions were not as susceptible to damage as apple scions (3), peach stems provided a useful standard with which to check the various vole lots. In 1975 and 1976, 'Golden Delicious' stems were challenged against 'Golden Delicious' to determine the validity of the test procedure (Table 1). These comparisons resulted in a non-significant t-test at 5% when 'Golden Delicious' were challenged with 'Golden Delicious' and a significant test, 5% or 1%, with 'Glohaven' peach scions.

A Japanese rootstock, *M.* X *sublobata* PI 286613 was rejected by the voles in all 3 years (2 trials were made in 1976). Selections from the cross (Malling 9 × PI 286613) tested in 1975 and 1976 indicated at least 1 clone (70M963-41) was resistant; however, the inconsistent results between the 2 years could not be explained. These trees bore a crop in 1976, but not in 1975 and physiologically they could have been different. The Canadian rootstock, *M.* X *robusta* 'R5', was less consistently rejected in 4 tests; limited testing of 'R5' open-pollinated seedlings was inconclusive. Also, 'Ivory's Double Vigour' showed resistance in 2 of 3 years.

Two prairie crabapples, *M. coronaria* 'Charlotte' and *M. ioensis* 'Hucker No. 1' were attacked but lightly in 1975 and 1976. Two flowering crabs derived from crosses between common apple and Oriental crabs, 'N.Y. 11928' and 'Sissipuk', appeared resistant.

An indication of resistance to pine vole was not detected in 'Virginia Crab' or 'Stayman'.

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J. Amer. Soc. Hort. Sci. 102(2):203–210. 1977.

Fruit Growth and Development, Ripening, and the Role of Ethylene in the 'Honey Dew' Muskmelon[1]

Harlan K. Pratt, John D. Goeschl[2], and Franklin W. Martin[3]
Department of Vegetable Crops, University of California, Davis, CA 95616

Additional index words. Cucumis melo, flowering, fruit set, firmness, soluble solids, maturation

Abstract. **The muskmelon cultivar Honey Dew (*Cucumis melo* L.) has unique horticultural and physiological characteristics, most notably an unusually long period between attainment of acceptable horticultural maturity and self-ripening in the field. Patterns of flowering, fruit set, fruit growth, solids accumulation, softening, ethylene production, respiration, and variation among individual fruits were studied during several seasons. Internal ethylene concentration may be estimated by the following formula: ppm internal = 3.7 ± 1.2 × rate of production in μl/kg-hr. The act of harvesting had no effect on ethylene production or internal concentration. Full ripening required an internal ethylene concentration of about 3 ppm. Horticultural maturity was attained at 35 to 37 days after anthesis, but self-ripening required about 47 days. Commercial harvests include fruits in this range of ages, so treatment with ethylene is required for uniform ripening and consumer satisfaction.**

The 'Honey Dew' muskmelon (*Cucumis melo* L.) is an old cultivar of high quality with distinctive appearance and flavor and unique horticultural and physiological characteristics. 'Honey Dew' fruits differ from the "cantaloupes" in lack of a well-developed abscission layer until commercially overripe, little or no corky net, higher sugar content, a different pattern of fruit growth, and virtual freedom from market disease unless damaged (usually by chilling). This cultivar is adapted only to areas with long, hot, dry growing seasons; leaf disease has

[1]Received for publication September 23, 1976. This work was supported in part by research grants from the U.S. Public Health Service (FD-00071) and from the California Melon Research Board. We acknowledge the advice and assistance received over many years from Mr. B. E. Giovannetti, Half Moon Fruit and Produce Co., Yolo, California. Mr. R. F. Kasmire has reviewed our manuscript.

[2]Present address: Biosystems Research Division, Department of Industrial Engineering, Texas A&M University, College Station, TX 77843.
[3]Present address: Mayagüez Institute of Tropical Agriculture, Mayagüez, Puerto Rico 00708.