'Hannah's Choice F₁': A New Muskmelon Hybrid with Resistance to Powdery Mildew, Fusarium Race 2, and Potyviruses

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Additional index words. *Cucumis melo* L., disease resistance, papaya ringspot virus, watermelon mosaic virus, zucchini yellow mosaic virus, *Podosphaera xanthi*, powdery mildew

Abstract. 'Hannah's Choice F₁' is a new, high quality eastern type muskmelon (*Cucumis melo* L.) with multiple disease resistance. It was developed in the Department of Plant Breeding at the Cornell University Agricultural Experiment Station in Ithaca, N.Y. It is well adapted for northeastern U.S. conditions and shows potential for good adaptation in the northwest. With multiple disease resistance it is well suited for home gardeners, market gardeners, and commercial growers. 'Hannah's Choice F₁' has excellent resistance to powdery mildew races 1 and 2 (*Podosphaera xanthi*) and some tolerance to Fusarium root rot (*Fusarium oxysporum* f. sp. *melonis*) race 2. In addition, it has resistance to watermelon mosaic virus (WMV), papaya ringspot virus (PRSV), and zucchini yellow mosaic virus (ZYMV). This is the first commercial melon to have combined resistance to these three potyviruses. Also, it has shown some field tolerance to spider mites (*Tetranychus urticae*). Lastly, it has shown some field tolerance to downy mildew (*Pseudoperonospora cubensis*), angular leaf spot (*Pseudomonas syringae* pv. *lachrymans*), and gummy stem blight (*Didymella bryoniae*). In 2001, 2002, and 2003 it was grown in replicated trials in New York and in 2002 and 2003 in Oregon.

Origin and History

The parents of 'Hannah's Choice F₁' originate in two different breeding programs at Cornell University as shown in Fig. 1. The first parent is NPC[™] Rd (netted=N; powdery mildew resistant=P; charentais flavor=C; monoecious=M; and round=Rd). NPC[™] Rd was selected from a powdery mildew resistant (PMR) French Charentais melon, which was then crossed to a PMR version of 'Iroquois' and a monoecious Charentais type. The original 'Iroquois' was bred by Henry M. Munger and released in 1944 at Cornell University in response to the growing problem of *Fusarium* race 2 wilt (Munger, 1944). Over a period of 25 years and through a combination of disease screening, backcrossing, and pedigree selection; netting, powdery mildew resistance, monoeciousness, and round fruit were combined to generate NPC[™] Rd. NPC[™] Rd averages 1.6 kg and has soft orange flesh. This melon is unique in that it is monoecious, yet round. Typically, round fruit is associated with andromonoecious sex expression and oblong fruit with monoecious sex expression.

Received for publication 6 Apr. 2004. Accepted for publication 11 Sept. 2004. We thank Mahmoud Lotfi and Betsy Ingall for assistance in evaluating melon quality, George Moriarty for technical support, and Mary Kreitinger for assistance with statistical analysis. We acknowledge support from USDA IFAP Plant genome Award 2001-52100-113347 through the Public Seeds Initiative. We also thank Hannah Kyle for assistance in evaluating melon quality and for the use of her name. Lastly, we thank Dick Robinson and Chris Wien for reviewing this paper.

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These associations were first reported by Rosa (1927), and then confirmed by Kubicki (1962), Foster (1970), and Wall (1967).

The second parent is a multiple disease resistant 'TAM Uvalde' type melon. The original

'TAM Uvalde', bred at Texas A&M University by R.T. Correa, has downy and powdery mildew resistance as well as excellent muskmelon flavor and high sugar (Correa, 1977). It is a round, andromonoecious melon with a small seed cavity, thick orange flesh, averages 1.4 to 2.7 kg, and has a distinct green-orange interface at the rind. It has shown excellent combining ability. 'TAM Uvalde' was crossed to PI 414723-4, selected for virus resistance from PI 414723 by R. Provvidenti at the New York State Agriculture Experiment Station (NYSAES), Geneva, and then backcrossed five times to 'TAM Uvalde' while selecting for virus resistance. In succeeding generations it was self and sib-pollinated to stabilize and combine resistance to WMV, PRSV, and ZYMV. It has retained a high level of resistance to powdery mildew races 1 and 2, as well as some resistance to downy mildew. PI 414723-4 has since been shown to have resistance to powdery mildew (Anagnostou et al., 2000). In addition, there is genetic linkage between resistance to WMV and ZYMV (Anagnostou et al., 2000).

In Winter 2001, a cross was made between NPC[™] Rd and a virus-resistant TAM Uvalde Cornell breeding line. The F₁ was planted in a replicated trial, along with other F₁ populations with NPC[™] Rd as a parent together with standard cultivars. The NPC[™] Rd × virus resistant TAM Uvalde, experimentally designated NY01-907, stood out prominently with respect to vine health, productivity, and fruit quality.

Disease and Insect Resistance

'Hannah's Choice F₁' is highly resistant

Table 1. Disease resistance and susceptibility of muskmelon cultivars.

Cultivar	Powdery mildew index ^x	Virus index ^w		
		PRSV	WMV	ZYMV
Hannah's Choice F ₁	R	R	R	R
Goldstar F ₁	S	S	S	S
Earlqueeen F ₁	S	S	S	S
Sugar Bowl F ₁	R	S	S	S
Athena F ₁	R	S	S	S
PXC 221 F ₁	R	S	S	S
Odyssey F ₁	R	S	S	S
Vienna F ₁	T	S	S	S

^xPowdery mildew (PM) disease index: S = susceptible, heavy PM symptoms; T = tolerant, some PM symptoms; R = little or no symptoms.

^wVirus disease index: S = susceptible, heavy virus symptoms; T = tolerant, delayed symptoms; R = resistant, no symptoms.

Fig. 2. Fruit of 'Hannah's Choice' muskmelon.

to powdery mildew races 1 and 2, has some *Fusarium* race 2 resistance, and is resistant to WMV, PRSV, and ZYMV (Table 1). 'Hannah's Choice' is the first commercial melon cultivar with resistance to these three potyviruses. Potyviruses are the largest and most economically important group of plant viruses (Riechmann et al., 1992). These potyviruses were maintained on *C. pepo* 'PMR Bush Acorn' (a Cornell cultivar) and plants were inoculated according to Anagnostou et al. (2000).

'Hannah's Choice F₁' has shown some field tolerance to angular leafspot, downy mildew, and gummy stem blight. Tolerance to downy mildew derives from the 'TAM Uvalde' parent, which was bred for resistance to downy mildew. Resistance to angular leaf spot and gummy stem blight may be due to these

diseases being present in the environment in which 'TAM Uvalde' was bred. 'Hannah's Choice F₁' has shown some field tolerance to spider mites when compared to other eastern shipper types. It is unknown where this resistance derives from. One possibility is that it comes from PI 414723-4, which has resistance to melon aphid (*Aphis gossypii*) (McCreight et al., 1984) and is the source of potyvirus resistance in 'Hannah's Choice F₁'.

Description

'Hannah's Choice F₁' has a large, dense vine with medium green foliage. The fruit is highly netted, ribbed, slightly oval, monoecious, and slips when ripe. The rind is very firm, which gives it some shipping quality, comparing well to Western shippers sold in east coast markets. In a

rind firmness test that compared western shipper melons from a local grocery store, the rind firmness of 'Hannah's Choice F₁' was not statistically different from the western hybrid muskmelons. The rind firmness of 'Hannah's Choice' melons that had been in cold storage at 3.3 °C for 7 d averaged 1713.0 kN·m⁻² with a standard deviation of 162.2. Western shipper melons from the local grocery store averaged 2030.8 kN·m⁻² with a standard deviation of 379.3. In one informal test, 'Hannah's Choice' and 'Athena' were placed in uncooled storage. 'Athena' lasted 5 d before going soft, at which time 'Hannah's Choice' was still hard (P. Whitwood, personal communication). The ability to hold in storage observed in 'Hannah's Choice' likely comes from the virus resistant Cornell TAM Uvalde parent.

The interior fruit color is medium to dark orange with thick flesh and a distinct green-orange interface at the rind, as shown in Fig. 2. The seed cavity is small. The fruit has an average length to diameter (L:D) ratio of 1.1:1. Fruit length from stem end to blossom end averages 15.8 cm and width averages 14 cm. Depending on growing conditions and management, fruit weight averages between 1.6 to 2.3 kg. The fruit mature in about 85 to 90 d from seeding. Taste tests show that the quality (flavor, sugar, and texture) was higher than other standard eastern shippers and the older disease susceptible cultivars 'Goldstar' and 'Earlqueeen'. 'Hannah's Choice' has a distinct musky cantaloupe flavor and high sugar content. In general it compares well with other similar cultivars in terms of yield, fruit weight, soluble solids, and quality (Table 2)

Availability

Seed is available from Meyer Seed International, 354 Center Grange Rd., Monaca, PA 15061; phone 866-841-1800; fax 724-775-1544; e-mail jfrancis@stargate.net. Look for seed for 2005 from companies that sell certified organic seed.

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Table 2. Average yield, fruit weight, soluble solids, and quality of muskmelon cultivars in a replicated field trial.

Cultivar	Yield (t/ha)	Fruit wt (kg)	Soluble solids (%) ^y	Quality ^y
Hannah's Choice F ₁	33.7	1.5 ± 0.1	12.3 ± 0.2	8.6 ± 0.1
Goldstar F ₁	13.4	1.1 ± 0.1	8.3 ± 0.7	4.7 ± 0.8
Earlqueeen F ₁	6.4	0.2 ± 0.1	5.0 ± 0.4	1.6 ± 0.6
Sugar Bowl F ₁	19.2	0.7 ± 0.1	9.3 ± 0.7	6.0 ± 0.8
Athena F ₁	29.1	1.7 ± 0.1	12.3 ± 0.4	7.9 ± 0.5
Odyssey F ₁	25.8	1.7 ± 0.1	9.2 ± 0.3	6.8 ± 0.2
Vienna F ₁	27.5	1.7 ± 0.1	9.9 ± 0.5	7.1 ± 0.4

^yTotal soluble solids determined with a Fisherbrand refractometer, 0% to 32% scale.

^yQuality scale: 1 = very poor, inedible, 9 = excellent combination of sweetness and flavor.