‘Charleston Hot’, a Southern Root-knot Nematode-Resistant, Yellow-fruited Cayenne Pepper with a Compact Plant Habit

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‘Charleston Hot’ is an open-pollinated cayenne pepper (*Capsicum annuum* L.) that exhibits an exceptionally high level of resistance to the southern root-knot nematode [*Meloidogyne incognita* (Kofoed & White) Chitwood] and a unique combination of horticultural characteristics. The southern root-knot nematode is a major pest of pepper, and parasitism of susceptible plants often results in severely stunted plants and greatly reduced yields. This pest is especially a problem for home gardeners because they often do not have access to alternative production sites or to nematicides and nematocide application equipment. ‘Charleston Hot’ has a compact plant habit, the initial mature-fruit color is an attractive yellow, the fruit are extremely pungent, and the yield potential is excellent.

Origin

‘Charleston Hot’ was developed at the U.S. Vegetable Laboratory, Charleston, S.C. It was derived from a heterogenous ‘Carolina Hot’ population using the pure-line selection method (originated as a bulk of an S₁ population derived from a single plant). ‘Carolina Hot’ is a cayenne-type pepper that was released in 1954 by Clemson Univ. (Martin and Crawford, 1958). It was originally described as having a spreading plant habit, red fruit, and resistance to root-knot nematodes. ‘Charleston Hot’ is homozygous for resistance to the southern root-knot nematode, and does not exhibit any obvious segregation for horticultural traits. It is a “sister” line of ‘Carolina Cayenne’, a root-knot nematode-resistant, large-vined, red-fruited cultivar derived via pure-line selection from the same ‘Carolina Hot’ population (Fery et al., 1986).

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Description

‘Charleston Hot’ has a short, erect plant habit. The plants are vigorous, uniformly branched, and reach a height of ≈45 cm. The foliage has a yellow-green color [Munsell (1990) rating: 2.5 GY 6/8], as opposed to the green foliage color typical of ‘Carolina Cayenne’ [Munsell (1990) rating: 5 GY 3/16]. It has a fruit shape similar to that described for ‘Carolina Cayenne’ (Fery et al., 1986). Typical ‘Charleston Hot’ fruits are straight to slightly curved, 2.2 cm in diameter at the base, and 9.6 cm in length (Fig. 1). The fruits, however, are somewhat smaller than those of ‘Carolina Cayenne’ (Table 1). Like the foli-

age, the young fruits are yellowish-green [Munsell (1990) rating: 2.5 GY 7/8]. As the fruits mature, the color gradually changes to a golden yellow [Munsell (1990) rating: 5 Y 8/10] and then to a brilliant orange [Munsell (1990) rating: 6.25 YR 7/14]—colors atypical of cayenne-type peppers. Fully mature fruits are quite pungent (70,000 to 120,000 Scoville heat units), and exhibit a bright, deep red color [Munsell (1990) rating: 7.5 R 4/16] that persists after drying. The calyx separates easily from the mature fruit. ‘Charleston Hot’ has consistently produced excellent yields (i.e., >100 fruits/plant), although generally less than those of ‘Carolina Cayenne’, in test plantings at Charleston, S.C. (Table 1).

‘Charleston Hot’ has exhibited a high level of resistance to southern root-knot nematodes in greenhouse tests (i.e., minimal numbers of galls and egg masses on the roots) (Table 2). Fery and Dukes (1996) reported that the resistance exhibited by the ‘Carolina Hot’ parent is conditioned by two genes, one dominant and one recessive. Field tests have shown that southern root-knot nematodes can reduce the marketable fruit yield of susceptible plants of the ‘Carolina Hot’ parent by more than 85% (Fery and Dukes, 1984). Field tests also showed that roots of ‘Carolina Cayenne’, the ‘Charleston Hot’ “sister” line that has the same type of resistance, yielded 99.7% fewer *M. incognita* eggs per gram of root tissue than did roots of

Fig. 1. Fruit of ‘Charleston Hot’ cayenne pepper. A typical fruit is 2.2 cm in diameter at the base and 9.6 cm in length.

Table 1. Some horticultural characteristics of 'Charleston Hot' and Carolina Cayenne' cayenne pepper (field test, Charleston, S.C.).²

Cultivar	Fruit/ plant (no.)	Fresh fruit		Dry fruit	
		Yield/ plant (g)	Mass/ fruit (g)	Yield/ plant (g)	Mass/ fruit (g)
Charleston Hot	134	789	5.89	178	1.33
Carolina Cayenne	144	1039	7.18	247	1.71
LSD _{0.05}	NS	220	0.88	40	0.21

²Yield data (total of four harvests) from a randomized complete-block experiment with four replicates (intrarow spacing, 76 cm; interrow spacing, 102 cm).

Table 2. Greenhouse evaluation of 'Charleston Hot' cayenne pepper plants for reaction to the southern root-knot nematode (*Meloidogyne incognita*, races 1 and 3), Charleston, S.C.

Cultivar or line	Race 1 ^y		Race 3 ^z		Eggs/mg root tissue (no.)
	Gall index ^x	Egg mass index ^w	Gall index ^x	Egg mass index ^w	
Charleston Hot	1.00	1.12	1.00	1.00	0.1
California Wonder ^v	4.95	4.72	---	---	---
PA-136 ^v	---	---	4.95	4.85	69.6
Mississippi Nemaheart ^u	1.20	1.00	---	---	---
Carolina Cayenne ^u	---	---	1.00	1.00	0.4
LSD _{0.05}	0.21	0.20	0.40	0.64	4.2

²Randomized complete-block design (four replicates, five plants per plot); each plant was inoculated with 3000 eggs 3 weeks after transplanting.

³Completely randomized design (four replicates, five plants per plot); each plant was inoculated with 2800 eggs two weeks after transplanting.

^xPlants rated on a scale of 1 to 5; 1 = no galling and 5 = severe galling.

^wPlants rated on a scale of 1 to 5; 1 = no egg masses and 5 = large number of egg masses.

^uSusceptible control.

^vResistant control.

a composite of susceptible lines selected from 'Carolina Hot' (Fery et al., 1986). Moreover, postharvest soil samples from plots with resistant plants yielded 99.9% fewer *M. incognita* larvae than did samples from plots with

susceptible plants. Recently completed work by Zamora et al. (1994) and Thies et al. (1997) has also demonstrated the resistance of 'Carolina Cayenne' to the southern root-knot nematode.

'Charleston Hot' is recommended for market and home garden use. The fruits are excellent for pickling, relishes, salsa, sauces, and dehydration. 'Charleston Hot' should perform well in areas where 'Carolina Hot' or 'Carolina Cayenne' are adapted.

Availability

'Charleston Hot' breeder's seed has been released to seed producers, and seed is currently available from several commercial seed companies.

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