PA-560, a Southern Root-knot Nematode-resistant, Yellow-fruited, Habanero-type Pepper

Richard L. Fery1 and Judy A. Thies
U.S. Department of Agriculture, Agricultural Research Service, U.S. Vegetable Laboratory, 2700 Savannah Highway, Charleston, SC 29414-5334

Additional index words. Capsicum chinense, Meloidogyne incognita, vegetable breeding.

PA-560 is a new Habanero-type pepper (Capsicum chinense Jacq.) released 20 Oct. 2009 by the Agricultural Research Service of the U.S. Department of Agriculture (USDA). PA-560 is a yellow-fruited, Habanero-type advanced breeding line that is homoyzogous for a dominant gene conditioning a high level of resistance to the southern root-knot nematode [Meloidogyne incognita (Chitwood) Kofoid and White]. The southern root-knot nematode is a major pest of peppers in the United States, and all Habanero-type cultivars currently popular with commercial growers and home gardeners are susceptible (Fery and Thies, 1997). The release of PA-560 will provide pepper breeders interested in developing yellow-fruited cultivars of Habanero-type peppers access to a near-cultivar quality parental line that is homoyzogous for the southern root-knot nematode resistance gene.

Origin

In 1995, recurrent backcross breeding procedures were initiated to transfer the dominant southern root-knot nematode resistance gene from a Scotch Bonnet accession into classical Habanero-type backgrounds (Fig. 1). The donor parent was PA-426 and the recurrent parent was PA-350. PA-426 is a southern root-knot nematode-resistant, Scotch Bonnet-type germplasm line that was released by the USDA in 1997 (Fery and Thies, 1997, 1998a, 1998b). PA-350, susceptible to southern root-knot nematodes, is a classical, Habanero-type cultigen obtained from an heirloom collector. In 2002, a total of 63 BC4F3 populations were evaluated in a greenhouse test for reaction to M. incognita and in a replicated field test for horticultural characteristics. Although superior, southern root-knot nematode-resistant, orange-fruited BC4F3 populations were identified in these 2002 tests, no resistant, yellow-fruited BC4F3 populations were found. However, one of the susceptible yellow-fruited BC4F3 populations (02-564) did exhibit superior horticultural characteristics, and a single plant from this population was subsequently crossed with a single plant from one of the resistant, orange-fruited BC4F3 populations (02-531) to initiate a pedigree breeding procedure to develop a southern root-knot nematode-resistant, yellow-fruited, Habanero-type line. PA-560 was derived from a single F3 (BC4F3 × BC4F3) plant grown in 2005. Both of the parental lines used in the last cross are sib lines of the orange-fruited, southern root-knot nematode-resistant cultivar TigerPaw-NR that was released by the USDA in 2006 (Fery and Thies, 2007).

Description

PA-560 has a compact plant habit (height = 83 cm; width = 103 cm) and produces campanulate (a flattened bell or lantern-type shape), yellow-colored fruit (Fig. 2). PA-560 fruit have a more elongate shape than those of 'TigerPaw-NR'. The period from transplanting to first harvest of mature fruit is 77 to 86 d at Charleston, SC (Tables 1 and 2). There are typically three pedicels per axil and the pedicel position at anthesis is intermediate. Flower petal color is white; the corolla throat markings are yellow, and the stamens have white filaments and purple anthers. At full anthesis, the length of the style is the same or slightly greater than the length of the stamen. The leaves are large, lanceolate-shaped, and have an intermediate green color. The stem pubescence is sparse and the leaves are glabrous. Fruit-bearing plants exhibit extensive anthocyanin pigmentation on the stems, branches, and petals; there is moderate pigmentation at the base of the pedicels. The seedling hypocotyl exhibits heavy anthocyanin pigmentation. The fruits are attached to the pedicel in a pendant manner (typically two fruit per cluster); the calyx is saucer-shaped (flat, does not envelop the fruit base); the calyx margin shape is dentate; the annular constriction at the junction of the calyx and pedicel is present; and the pedicels are short, curved, and slender. The fruits are non-deciduous, i.e., the pedicel and calyx usually remain on the fruit at harvest.

The results of two replicated field studies conducted at Charleston, SC, indicate the yield potential of PA-560 is comparable to that of traditional Habanero-type cultivars. In a 2006 field test, no difference in marketable fruit yield could be demonstrated between PA-560 and the recurrent Habanero-type parent PA-350 (PA-560: 17,313 kg ha−1; PA-350: 17,313 kg ha−1). In a 2007 field test, no difference in marketable fruit yield could be demonstrated between PA-560 and the commercial cultivar Habanero (PA-560: 6409 kg ha−1; Habanero: 6929 kg ha−1).

A typical PA-560 fruit weighs ≈7.6 to 8.0 g. The shape of the pedicel attachment end of the fruit is truncate, the neck at the base of the fruit is absent, and the shape at the blossom end of the fruit is pointed. The cross-section of a typical fruit at the level of the placenta exhibits a slightly corrugated shape; the longitudinal cross-section exhibits a narrow triangular to
trapezoid shape. A typical PA-560 fruit is 3.37 cm long and has a thin wall (1.43 mm) (Table 3). The color of immature fruit is a glossy, dark green; the color of harvest-stage fruits is a glossy, bright yellow (Munsell color rating: 3.8 Y 6.8/10.5). The fruits are extremely pungent (326,710 Scoville units), and a typical fruit has three locules (average number of locules: 3.3).

PA-560 is homozygous for a dominant gene that conditions a high level of resistance to southern root-knot nematodes. It exhibited a high level of resistance to the southern root-knot nematode in a 2006–2007 winter greenhouse test; no galls or egg masses were evident on any of the root systems (Table 4). The resistance exhibited by PA-560 is equal to that exhibited by the donor of the resistance gene, the Scotch Bonnet-type germplasm line PA-426.

The southern root-knot nematode-resistant, yellow-fruited, Habanero-type pepper breeding line PA-560 is homozygous for a dominant gene (accession number 54834) for development of southern root-knot nematode-resistant F1 hybrids.

Availability
Small trial samples of PA-560 breeder’s seed are available for distribution to all interested research personnel. Genetic material of this release will be deposited in the National Plant Germplasm System where it will be available for research purposes, including the development and commercialization of new cultivars. It is requested that appropriate recognition of source be given when this germplasm contributes to research or development of a new breeding line or cultivar.