A Heat-tolerant Broccoli F₁ Hybrid, 'Ching-Long 45'

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Broccoli (*Brassica oleracea* L. var. *italica*) is usually grown for its head production in regions where the average growing season temperature is 25 °C or lower. In a subtropical area, like Taiwan, it can only be grown during the fall, winter, and spring. In summer, there is no broccoli production and the market depends on imports from temperate regions of the world. Recently, a heat-tolerant F₁ hybrid of broccoli, 'Ching-Long 45', was released by the Ching-Long Seed Company. This cultivar can be used for commercial production between June and October in Taiwan, where temperatures range from 30 to 35 °C during the day, and 25 to 30 °C at night.

Origin

'Ching-Long 45' was derived in 1994 from a cross between B295 and B305 (Fig. 1). B295 is an inbred line of S₇ selected from a local cultivar, P 295, in southern Taiwan, and has high yield and resistance to both black rot [*Xanthomonas campestris* (Pam.) Dows.] and downy mildew [*Peronospora parasitica* (Pers. ex Fr.) Fr.]. B305 is an inbred line of S₆ from the progenies of hybrids between K305, a local cultivar of white-flowered Chinese kale (*B. oleracea* var. *alboglabra*), and P305, another local cultivar of broccoli (Fig. 1). B305 was selected for heat tolerance, head quality,

black rot, and downy mildew resistance. The heat tolerance of this F₁ hybrid is believed to be inherited from K305, since this local cultivar has been grown in southern Taiwan for a long period of time and is heat tolerant. In addition, at least three random amplified polymorphic DNA (RAPD) markers, which may be linked to this special characteristic of "heat tolerance," were found in 'Ching-Long 45', B305 and K305 (Yang et al., unpublished data).

Description

As the name suggests, 'Ching-Long 45' can be harvested for its primary head ≈45 d after transplanting seedlings into the field. Its paternal parent, B305, can be harvested 40 d and its maternal parent, B 295, 50 d after transplanting. At maturity the plant is ≈35 cm high and 60 cm wide. The foliage is bright green and the stem is light green in color. The leaves are oriented 45° from the vertical. The head is exerted ≈5 to 10 cm below the main leaves. There is a moderate dome with an average diameter of 15 cm, bright green in color, which bears relatively uniform buds 1.5 to 2.0 mm long. The plant bears only the primary head without lateral shoot development like 'Solohead' broccoli (Honma, 1986). After the primary head is harvested, lateral shoots develop. Most commercial cultivars emit a very strong odor, much of which is due to methyl mercaptan, acetaldehyde, and ethyl acetate (Thompson and Kelly, 1957). However, 'Ching-Long 45' emits less of this unpleasant odor than does another F₁ hybrid, 'Ching-Long 70', which has the same maternal parent as 'Ching-Long 45' and is grown for head production during fall, winter, and spring. For the last 2 years, 'Ching-Long 45' has been grown in summer in several fields near Tainan, southern Taiwan. Yield varies with time of harvest. Yield was evaluated in three treats

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Fig. 1. Pedigree of 'Ching-Long 45'.

Fig. 2. 'Ching-Long 45' broccoli taken in the field, (A) top view and (B) side view.

(i.e., growing periods) over four locations for 2 consecutive years at a planting distance of 50×60 cm (3000 plants/0.1 ha). The average head mass of each plant ranged from 290 ± 40 g in June to 550 ± 100 g in September, and total yield was 870 kg in June and 1650 kg in September. When grown in 15-cm pots for 90 d in a growth chamber with temperatures set at 33 °C day/27 °C night, heading occurred in 'Ching-Long 45' but not in 'Ching-Long 70' beginning 50 d after seeding.

Availability

Seed samples can be obtained from Yau-Wen Yang, Institute of Botany, Academia Sinica, Nankang, Taipei, Taiwan 11529.

Literature Cited

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