

An Effective Plant Field Cage to Increase the Production of Genetically Pure Chile (*Capsicum* spp.) Seed

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Chile (*Capsicum annuum* L.) plants are considered a self-pollinating crop (Allard, 1960); however, out-crossing rates (7% to 91%) recorded by several investigators suggest that *Capsicum* is a facultative cross-pollinating species in field research (Franceschetti, 1971; Odland and Porter, 1941; Tanksley, 1984). Although the amount of out-crossing varied among the investigations, it was sufficient to impede progress in breeding programs (Odland and Porter, 1941; Tanksley, 1984). The out-crossing is associated with natural insect pollinators, not rain or wind (Odland and Porter, 1941; Tanksley, 1984). The amount of cross-pollination affects the precautions needed to produce seed and the breeding methodologies used by the plant breeder.

Natural pollinators such as insects must be excluded to ensure self-pollination. To produce large amounts of genetically pure seed, seed certification programs have isolation requirements to control pollination (New Mexico Crop Improvement Association, 1992). Isolation distances range from 1.6 km for foundation seed to 0.4 km for certified seed. Breeding programs also require isolation during seed production. Thus, space for isolation becomes limited.

To ensure self-pollination, a simple and effective plant isolation cage was needed. This paper describes such an enclosure (Fig. 1).

The cage consists of nylon fabric draped on a frame constructed of conduit piping (Fig. 1A). A 3.05-m section of 19-mm-diameter galvanized electrical conduit pipe is bent in two places, making two "legs," each 1.22 m long (Fig. 1B). The cage netting material is a white polyester fabric (NK82P, Apex Mills, New York). A green fabric has been used successfully. With either color, no effects on plant growth, fruit set, or seed production have been observed in the southern New Mexico climate. The fabric is 1.73 m wide and comes

in 61-m rolls. Fabric mesh size has a count of 20×16 holes/2.5 cm². This mesh effectively excludes pollinating insects from the cage. A 18.3-m length of fabric is sufficient to house at least 60 *Capsicum* plants, an amount that is acceptable to maintain the genetic diversity of *Capsicum* germplasm (Ellis et al., 1985). Two fabric sheets are sown together (two short sides and one long side) with nylon thread. In the field, the fabric is slid over one of the pipe frames and a second pipe frame is placed inside the cage at the opposite end (Fig. 1B). The fabric is pulled to make the cage snug (Fig. 1C). Additional pipe frames may be placed at intervals inside the cage, as required, to support the fabric. To control aphids (*Myzus* spp.), insecticides may be necessary. A tractor-powered sprayer is used to spray the insecticide through the fabric onto the plants. It is not necessary to anchor the cages with soil. Even though New Mexico has strong winds, the fabric is heavy enough to lay flat on the ground without soil mounded on the edge. At the end of the season, the cage is washed and stored for the next season.

This type of cage is being used to increase and evaluate portions of the U.S. Dept. of Agriculture *Capsicum* germplasm accessions and breeding stocks of the New Mexico chile breeding program. Plants in the cages have produced sufficient seed set for several *Capsicum* species—*Capsicum annuum*, *C. chinense* Jacq., *C. frutescens* L., and *C. baccatum* L.

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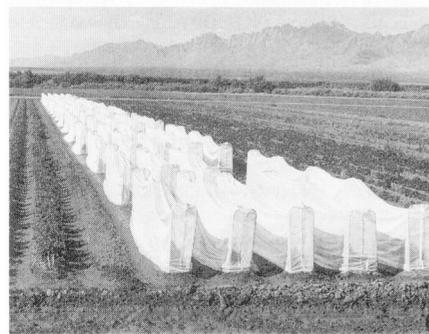
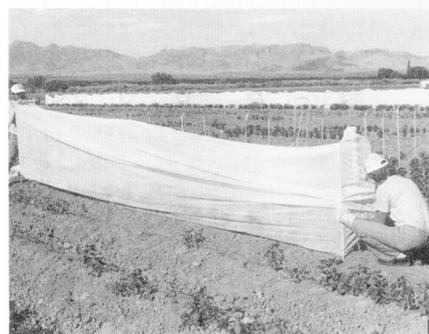


Fig. 1. Plant field cages for chile (*Capsicum* spp.) seed production being positioned in a field in southern New Mexico. (A) Conduit pipe frame being placed in the field, (B) fabric being draped over conduit pipe and the final frame being placed, and (C) finished cages in place with the fabric draped to the soil.