

Successful seed increase of *Phaseolus chiapasanus* Piper

J. Gereda, A. Mestizo, J. Ypiales, R. Sabogal, M. Santaella, L.G. Santos & D.G. Debouck
Genetic Resources Program, Alliance Bioversity International - CIAT, Cali, COLOMBIA, m.santaella@cgiar.org

Phaseolus chiapasanus is a wild bean of its own: it has the largest flowers in the genus (30x35 mm), big pods (120x20 mm) and discoid seeds (diam. 12 mm, 27.6 g/ 100 seeds), and upon drying all vegetative and reproductive plant parts turn black (Freytag & Debouck 2002). Its tricolporate pollen is unique, showing some affinity with the genus *Sigmoidotropis* (Piper) A. Delgado (Delgado-Salinas et al. 1982). It also has affinities with the sections *Brevilegumeni* Freytag and *Xanthotricha* A. Delgado (Delgado-Salinas et al. 2006), but its unique morphology justifies a separate section *Chiapasana* A. Delgado (1985). As most species of the genus, its karyotype is $2n=2x=22$ (Mercado-Rua`ro & Delgado-Salinas 1996). Although originally described from Chiapas in Mexico (Piper 1921), it also occurs in Oaxaca and Veracruz (Debouck 2014). So far no records exist for western Guatemala. It is a tall liana up to 10 m high, climbing in a humid lower montane tropical transition forest, where deforestation is high because of coffee plantations. It is thus interesting to have a few accessions in genebanks (four accessions exist in CIAT genebank) in order to know more about its potential. To that end it is important to develop regeneration capacity, of which some details are reported hereafter.

Given the original ecology (accession G40794 was collected in Oaxaca, Mexico, in the county of Santiago Xanica at 1,400 masl) the material was planted in the station of Tenerife (Colombia, Valle del Cauca, Cerrito; lat. N 03°41'30", long. W 76°04'23", elev. 2,160 masl). Planting was done in closed mesh-house with plastic roof and anti-aphids mesh walls. Mean temperature was 25.7°C (15.1°C-34°C), and mean air relative humidity 59.8% (36.6%-90.9%). A total of 30 plants were established in a row (Figure 1). After 2 years and 20 days or a total of 750 days it has produced 1,614 seeds (approved for viability (84%) and health, according to the standards of CIAT genebank; Gereda et al. 2018) (Figure 2). Flowering (with pollen viability of 95.6%) started 121 days after planting and was continuous while peaking three times in a year. The development of the pod from anthesis to maturity lasted 64 days. Hand pollination significantly increased the seed set (Figures 2 and 3).



Figure 1 – Row of *P. chiapasanus* plants established in a mesh-house in Tenerife; left scale 1 m high.

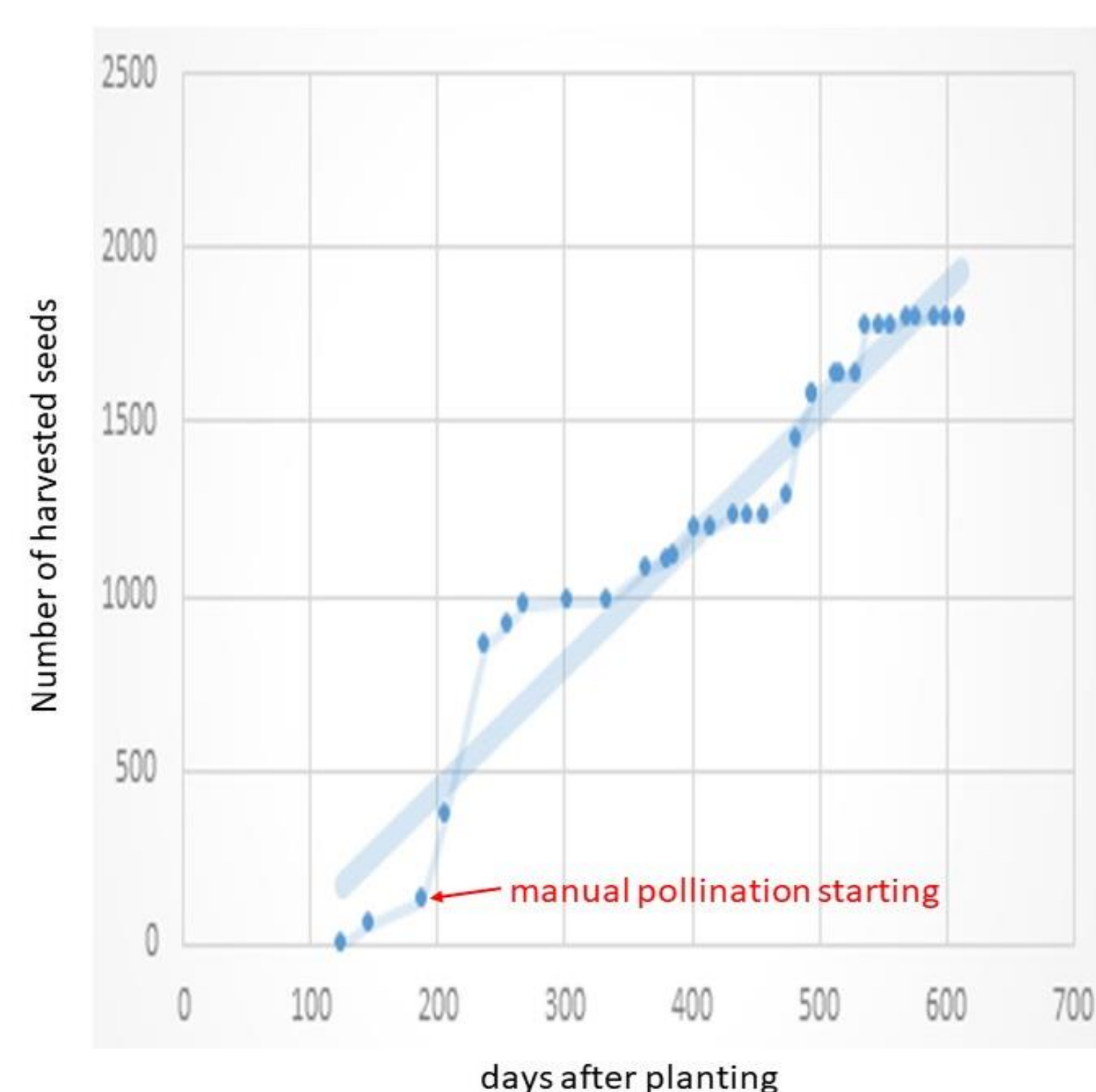


Figure 2. Evolution of seed production over time.

The root system was a significant part of the total biomass (Figure 4), indicating a reproductive strategy of dual purpose. The tuberous root system helps to the establishment of the climbing aerial part when rains resume, and thus helps the species to compete with other bushes and vines in the understory of the forest. Because of its pluriannual habit, it will have several seed dispersal events of relatively large seeds, both contributing to the survival of a few individuals in the progenies.

Concluding, in altitude and equinoctial conditions it is possible to produce enough quality seed of a forest species such as *P. chiapasanus*. Providing more height to the plants, it could be possible to obtain a higher biomass and eventually a higher number of seeds. We were able to keep *P. chiapasanus* plants for months in a growth chamber in Palmira but without flowering because of frequent clipping of the shoots.



Figure 3. Features of the biological cycle of *P. chiapasanus* (G40794) in Tenerife station; clockwise from upper left: close-up of flower one day after anthesis with lilac color of petals fading and a black spot at the sinus of the standard upper margin; exposure of stigma by pressing the left wing; bringing pollen on the stigma with help of pencil point; tuberous root systems and lower stems of three plants in the row.

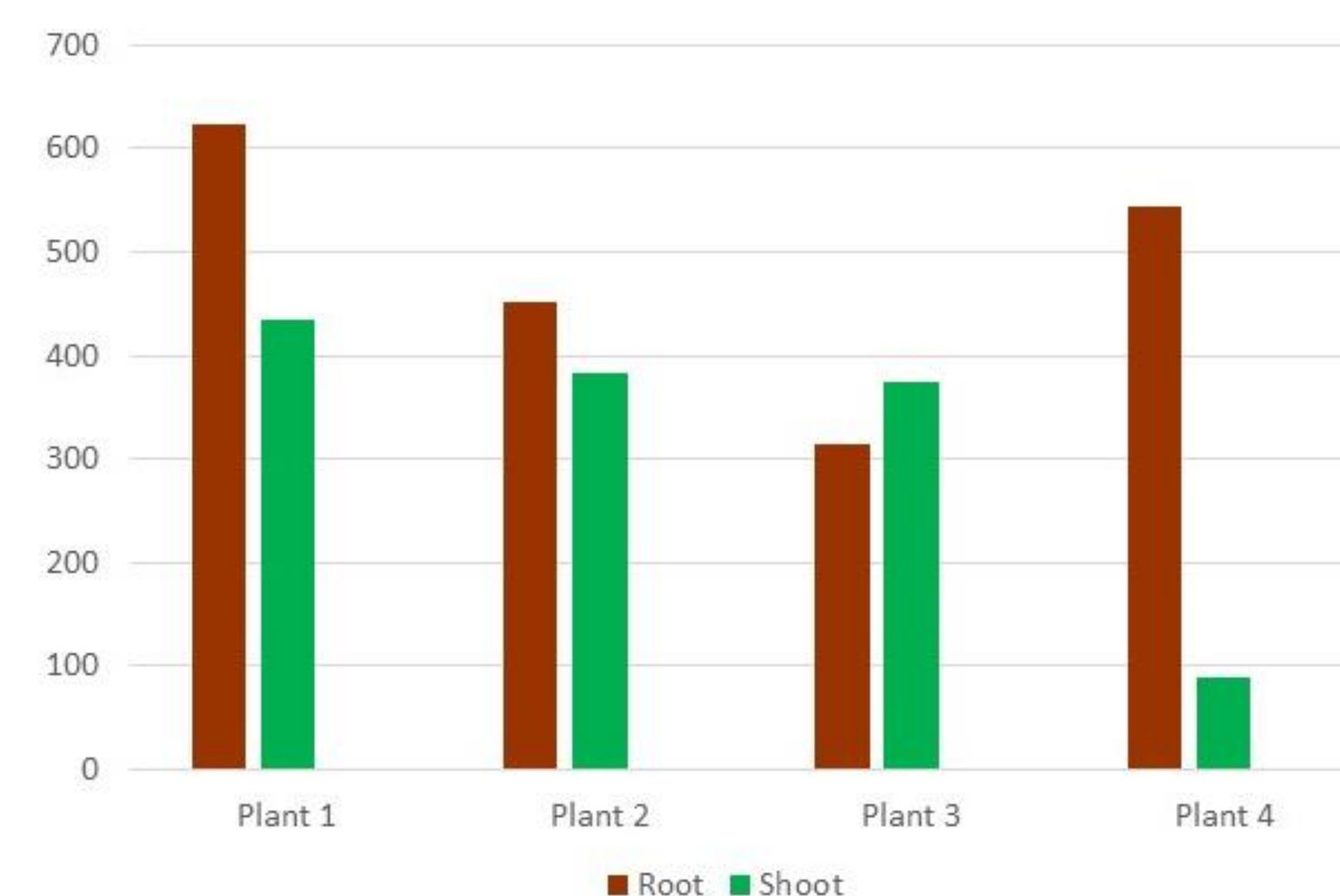


Figure 4. Biomass produced in g (fresh weight) between the underground and aerial parts of four plants of *P. chiapasanus* sown in Tenerife 1,056 days after planting.

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