Pak. J. Sci. Ind. Res. 2005 **48**(1) 55-56

Short Communication

Mechanism of Monocarpic Senescence of *Momordica dioica:* Source-Sink Regulation by Reproductive Organs

Ashis Ghosh
Saraswati Vidyamandir, P.O. Midnapore, Dist. Paschim Medinipur, 721 101, W.B., India

(received February 25, 2003; revised September 13, 2004; accepted November 20, 2004)

Abstract. Average chlorophyll levels of male (♂) plants alongwith defruited plants of *Momordica dioica* were higher than female (♀) plants or monoecious plants. The order of senescence was as follows: ♀ > monoecious > ♂ > defruited. Protein content in the leaves and dry weight of aerial plant parts remained higher in ♂ as compared to defruited, ♀ and monoecious plants. Evidently, the absence of fruit was noted to delay senescence.

Keywords: chlorophyll, defruited plant, monoecious, protein, dry weight, *Momordica dioica*

Most of the Cucurbitaceous plants are annuals and monoecious. In a strict sense, however, not all fruit bearing Cucurbitaceous plants are monoecious annuals showing monocarpic senescence. *Momordica dioica* seems to provide useful evidences for the determination of whole plant senescence in annuals. Though most of these plants are hermaphrodite, yet some are unisexual (dioecious). So, except a few, Cucurbitaceous members are monoecious. Due to peculiar male-female differentiation of *M. dioica,* it was selected for the study of mechanism of monocarpic senescence. *Momordica* has 3 types of plants (♂ , ♀ and ♂♀ plants) developed from the same lot of seeds in the same field under normal conditions. This paper aims at separating the role of male and female flowers in relation to their combined effect (monoecious plants) during correlative senescence of this plant.

Certified seeds of *M. dioica* were procured from Bhubaneswar, Government of Orissa, India. Seeds were surface sterilized in 0.1 % $HgCl_2$ for 1 min and then washed well in running water. *M. dioica* seeds were sown in the field in lines on the ridges (80 cm apart) at the advent of winter (November). Soil was moist lateritic, previously mixed with rotted farmyard manure. Watering was done as and when required. All the experiments were conducted in a net-house to avoid damage from pests. It was noted on seed germination that few plants were bisexual, some produced only male flowers, while maximum number of plants produced fruits. Twenty plants were defruited through excision of fruits. For the determination of senescence and source-sink relationship, chlorophyll and protein levels of leaves as well as dry weight of the aerial plant parts were determined at the plant age of 240 days.

Chlorophyll was extracted from 50 mg randomized samples of leaves with chilled acetone (-4 °C) and the values were determined at 660 nm in a Spectrochem spectrophotometer according to Arnon (1949). After removing chlorophyll, the leave samples were washed 3 times with trichloroacetic acid (18 %) and the residue dissolved in 1 ml of 0.5 M NaOH at 85 °C for 1 h. After removing the tissue debris, protein was determined with Folin-phenol reagent (Lowry *et al.,* 1951). For the determination of dry weight, the aerial plant parts were oven dried at 80 °C for 12 h. Each determination was done on 3 replicates and the entire experiment was repeated at least thrice. All the data were statistically analysed by taking the source of variance as days, replication and error. The critical difference (CD) values were calculated at the significant level P = 0.05 (Panse and Sukhatme, 1967).

The female plants senesced earlier than the male plants. The chlorophyll level (Table 1) of defruited and male plants remained higher than those of female and monoecious plants indicating the senescence pattern as follows: female > monoecious > male > defruited. Maximum deferment of senescence in both defruited and male plants may possibly be due to the absence of fruits, which may be the initiator of the senescence signal. The senescence signal developed in the fruits and migrated downwards for the induction of leaf senescence as reported earlier (Ghosh, 2002; Ghosh and Biswas, 1995;

Table 1. The levels of chlorophyll, protein and dry weight of plants at the plant age of 240 days (just prior to harvest)

Plant category	Chlorophyll (mg/g FW)	Protein (mg/g FW)	Dry weight (g/plant)
Male (♂)	1.04	41.10	32.20
Defruited	1.07	40.80	32.00
Female (♀)	0.67	22.40	30.10
Monoecious	0.84	20.10	31.00
CD at 5 %	0.15	4.25	00.66

CD: critical difference; FW: fresh weight

Biswas and Mandal, 1987; Nooden, 1984; 1980). The level of protein in the leaves of defruited and male plants remained higher than those of female and monoecious plants (Table 1). Greater protein level in the leaves of the defruited and male plants may be due to the lack of fruits. Maximum increase in the dry weight of aerial plant parts was found in male plants, which again indirectly supports the predominant role of fruits for the early onset of senescence in plants.

Acknowledgement

Author would like to express his deepest sense of gratitude to Profs. Bimal Krishna Das, Pranesh Banerjee and A. K. Biswas for their encouragement.

References

Arnon, D. I. 1949. Copper enzymes in isolated chloroplasts: polyphenol oxidase in *Beta vulgaris. Plant Physiol.* **24:** 1-15.

Biswas, A. K., Mandal, S. K. 1987. Whole plant senescence in *Pennisetum typhoides*: implication of source-sink relationship. *J. Plant Physiol.* **127:** 371-377.

Ghosh, A. 2002. Mechanism of monocarpic senescence of *Trichosanthes dioica*. *Pak. J. Sci. Ind. Res.* **45:** 212.

Ghosh, A., Biswas, A. K. 1995. Regulation of correlative senescence in *Arachis hypogaea* L by source-sink alteration through physical and hormonal means. *J. Agron. Crop Sci.* **175:** 195-202.

Lowry, O. H., Rosebrough, N. J., Farr, A. L., Randall, R. J. 1951. Protein measurement with the Folin-phenol reagent. *J. Biol. Chem.* **193:** 265-275.

Nooden, L. D. 1980. Senescence in the whole plant. In: *Senescence in Plants,* K. V. Thimann (ed.), pp. 219-258, CRC Press Inc., Boca Raton, Fl, USA.

Nooden, L. D. 1984. Integration of soybean pod development and monocarpic senescence. *Physiol. Plant.* **62:** 273-284.

Panse, V. G., Sukhatme, P. T. 1967. *Statistical Methods for Agricultural Work,* pp. 150-157, 2nd edition, ICAR, New Delhi, India.