

BRIEF COMMUNICATION

Growth and photosynthesis in bell-pepper as affected by sink manipulation

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Developing fruits on lower nodes were major reproductive sink for photosynthates in bell pepper (*Capsicum annuum* L.). The removal of these fruits resulted in faster growth of other fruits on upper nodes. Sink manipulated plants have the higher rate of net photosynthetic rate at the later stages of plant development.

Additional key words: *Capsicum annuum*, fruit load, stomatal conductance.

Fruit constitutes the main sink for assimilate in bell-pepper during reproductive phase of the plant. Increased sink load due to more fruits change the dry matter distribution between the vegetative parts (Nielsen and Vierkov 1988). The present study was conducted to determine the effect of reproductive sink load modification at different nodes of plant on growth and photosynthesis in bell pepper.

Uniform seeds of bell-pepper (*Capsicum annuum* L.) cv. Arka Gaurav and cv. Arka Basant were raised in polythene bags (12 × 18 cm) containing garden soil and farm yard manure 3:1 (v/v). The irradiance varied from 1100 to 1650 $\mu\text{mol(PAR)} \text{ m}^{-2} \text{ s}^{-1}$ and minimum and maximum temperatures between 20 to 22 and 29 to 31 °C, respectively under natural environmental conditions.

The reproductive sink load was modified as follows: T1 - flowers and fruits allowed to grow (control), T2 - flowers from 1st and 2nd flowering nodes were removed, T3 - fruit from 1st flowering node was removed as it sets, T4 - fruits from

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Abbreviations: P_N - net photosynthetic rate; g_s - stomatal conductance.

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1st and 2nd flowering nodes were removed as they set, T5 - fruit from 1st flowering node was removed 10 d after its setting.

The net photosynthetic rate (P_N) and stomatal conductance (g_s) were determined by portable open photosynthetic system (LCA3, ADC, Huddersdon, England) 10, 20 and 40 d after treatment. Leaf area was measured using a LI-3000 portable leaf area meter.

In both cultivars maximum plant height was observed in the plants where flowers from 1st and 2nd flowering nodes were removed (T2) (Fig.1). A considerable decrease (9 % in cv. Arka Gaurav and 21 % in cv. Arka Basant) in the total plant dry mass accumulation was found after the removal of 1st flowering node fruit 10 d after its setting (T5) indicating that 1st flowering node fruit acts as a major sink for assimilate, though its removal at later stages of its growth does not increase significantly the partitioning of dry mass to other fruits on upper nodes of the plant (Fig 1). Ali and Kelly (1992) found that the inhibitory effect of old fruits on the increase in fresh mass, length, diameter and pericarp thickness of younger ones was significantly only from flower bud inception through weeks 2 and 4 after fruit set in the glasshouse and field, respectively, and thereafter the effect was not significant. With the advancement of fruit growth the 1st flowering node fruit acts as a major sink for photosynthates (10.2 %) upto 20 d of flowering and afterwards becomes weaker sink (Bhatt and Srinivasa Rao 1993). Among the treated plants the accumulation of dry mass in other fruits was more in T3 in both cultivars (Fig. 1). The pattern of dry mass distribution to fruits in relation to other vegetative sinks was better in the plants where fruit from 1st node was removed as it sets in both the cultivars.

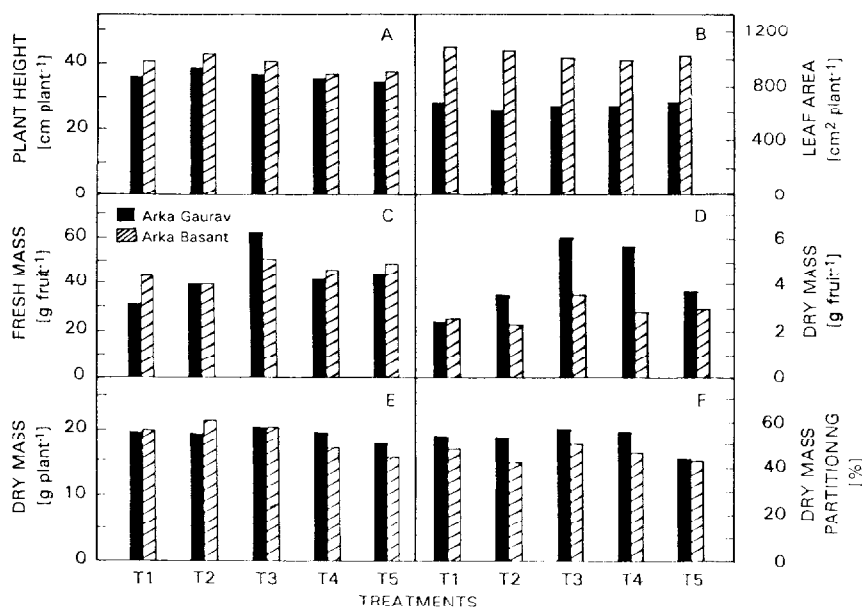


Fig. 1. Plant height (A), leaf area (B), fruit fresh mass (C), fruit dry mass (D), total dry mass (E) and dry mass partitioning to fruits (F) as affected by fruit load manipulation.

In the plants where reproductive sinks were modified the P_N was higher than in control plants during later stages of growth in both cultivars (Table 1). In cv. Arka Gaurav higher P_N was maintained in both the leaves of plants where 1st node fruit was removed after its setting (T3) during the later stage of growth. However, in cv. Arka Basant the higher rate of P_N was observed in the plants where fruits from 1st and 2nd nodes were removed as they set (T4). Stomatal conductance was not significantly affected by sink manipulation.

Table 1. Net photosynthetic rate, P_N [$\mu\text{mol m}^{-2} \text{s}^{-1}$] and stomatal conductance, g_s [$\text{mol m}^{-2} \text{s}^{-1}$] as affected by reproductive sink manipulation in bell-pepper cvs. Arka Gaurav and Arka Basant 10, 20 and 40 d after treatment.

	cv. Arka Gaurav						cv. Arka Basant					
	P_N			g_s			P_N			g_s		
	10	20	40	10	20	40	10	20	40	10	20	40
1 st flowering node leaf												
T1	9.4	9.3	7.1	1.0	0.9	0.5	9.7	8.1	6.4	1.4	0.4	0.5
T2	8.4	11.3	8.6	0.7	1.0	0.6	7.0	8.1	7.0	0.4	0.5	0.4
T3	9.0	11.4	9.2	0.5	1.1	0.6	9.0	9.4	6.0	1.6	1.0	0.4
T4	7.5	13.0	7.0	0.5	1.9	0.5	9.5	9.4	9.5	0.8	1.0	0.7
T5	8.5	-	-	0.6	-	-	7.5	6.0	-	0.3	0.4	-
upper leaf												
T1	12.0	12.2	11.1	1.2	1.3	0.8	11.6	10.2	8.8	0.8	0.8	0.5
T2	11.1	14.8	11.5	1.2	1.5	0.8	10.5	9.3	9.2	0.5	0.5	0.4
T3	10.8	14.3	13.1	1.5	1.4	0.9	10.8	10.7	10.2	1.3	0.6	0.4
T4	11.6	14.3	12.6	1.0	1.8	0.9	10.7	11.7	13.3	1.7	0.8	0.7
T5	8.5	-	-	0.6	-	-	10.1	9.2	-	0.7	0.5	-

These data indicated that the developing fruits on lower nodes are the active sink in bell pepper and the removal of these fruits resulted in the faster growth of other fruits on upper nodes and thus increase P_N of the leaves of the plant.

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