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EFFECT OF NIPPING AXILLARY FLOWER BUDS ON YIELD AND YIELD COMPONENTS IN RHA-274 LINE OF SUNFLOWER (*HELIANTHUS ANNUUS*) AND ITS IMPLICATION IN SEED PRODUCTION

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ABSTRACT

Effect of nipping axillary flower buds on seed yield and yield components in RHA-274 (restorer) line of sunflower was investigated. Generally, the nipped plants had higher mean values for the characters studied. Seed yield increased by 26.3% in the nipped plants over the normally branched plants mainly due to increased 100-seed weight. However, increased seed yield in the nipped plants was compensated by increased oil content in the branched plants, thus maintaining the same oil yield per plant in both nipped and branched plants. The significance of inducing plants to produce monoheads artificially is discussed in view of the seed production programmes.

Key words: Nipping, sunflower, axillary flowers, seed yield, oil yield.

In the sunflower hybrid seed production, cytoplasmic male sterile lines (CMS) are crossed with fertility restorer (RHA) lines [1]. Profuse branching in the RHA line is generally preferred due to prolonged flowering of such plants, resulting in continuous pollen supply for pollination to obtain maximum hybrid seed yield. Due to its branching habit, it produces many small axillary flowers which mature at different intervals. This creates harvesting and threshing problems in breeder and foundation seed production programmes. In addition, due to its small seeds, it is difficult to sow exact number of seeds per hill and also seedling establishment may not be good.

Hence an attempt has been made in the present study to nip the axillary flowers (shoots) at the bud initiation stage and compare the difference for seed yield and its components between branched and nipped plants of RHA-274 line.

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MATERIALS AND METHODS

RHA-274 is a restorer line, which restores the fertility of CMS-234A in the production of BSH-1 hybrid seed. RHA-274 was sown at the spacing of 60 x 30 cm. In alternate rows, only main head was maintained by nipping the axillary flower buds throughout the plant growth. The remaining rows were used as control where all the axillary flowers were allowed to develop.

At maturity, 30 plants at random were labelled separately in both branched and nipped plants, and observations on plant height, stem girth, head diameter, number of seeds in the main head and per plant, percentage of filled seeds, 100-seeds weight, number of axillary flowers, main head yield, seed yield per plant, oil percentage, and oil yield per plant were recorded. Seeds from the branched and nipped plants were sown on germination paper and observations like germination percentage, shoot and root length, dry weight and vigour index (length of the embryonic axis (cm) x germination % [2]) were recorded. The Student's t test was applied to test the significance of difference in means.

RESULTS AND DISCUSSION

Majority of the characters differed significantly in the branched and nipped plants. In general, the nipped plants had greater mean values of the characters studied, except plant height, seed filling percentage, and oil content (Table 1). Mean plant height was greater in the branched plants (118.8 cm) than in the nipped plants (109.0 cm). The nipped plants developed a larger capitulum, hence served as a larger sink for the available resources, thus, probably suppressing the plant height to an extent. Seed yield of the nipped plants increased by 26.3% over the branched plants. Similarly, increased leaf yields in desuckered plants over control was reported in tobacco [3, 4]. Higher grain yields have been reported in wheat after defoliation [5] and French bean [6]. On the other hand in castor, nipping of buds decreased the yield drastically [7], but partial removal did not effect yield.

In the nipped sunflower plants, yield increase was mainly due to higher 100-seed weight (5.4 g), to some extent, at the cost of oil content of the seed (26.8%) as compared to the branched plants (3.50 g and 35.7%, respectively). This is further confirmed by the fact that oil yield per plant remained almost unaltered in both nipped (6.76 g) and branched plants (6.7 g). In addition to this, probably there is a source limitation on the development of reproductive sinks in the branched plants. The reproductive sinks may compete directly with other sinks, such as newly developing shoots and flowers etc., for the available assimilates, thus, the latter diverting carbohydrates from the former (reproductive) sinks. However, in the nipped plants, all the resources are channelized into the reproductive sink (main head), thereby increasing seed yield. The seeds obtained from the nipped and

Table 1. Range, mean and t test in branched and nipped plants of RHA-274 line of sunflower

Character	Plant type	Range	Mean ± SE	t-value
Plant height (cm)	Branched	89–151	118.8 ± 10.9	
	Nipped	86–136	109.0 ± 12.2	3.29
Stem girth (mm)	Branched	8.0–17.5	11.7 ± 2.1	
	Nipped	9.0–19.0	14.2 ± 2.6	1.21
Main head diameter (cm)	Branched	6.0–10.5	8.3 ± 1.8	
	Nipped	9.5–18.0	13.3 ± 2.2	9.17*
Seed number in main head	Branched	136–559	315.1 ± 105.2	
	Nipped	215–715	464.0 ± 153.0	4.23*
Filling in main head (%)	Branched	38.2–95.1	71.1 ± 13.7	
	Nipped	33.8–87.0	58.0 ± 15.2	3.36*
No. of axillary flowers	Branched	4.0–22.0	9.9 ± 5.3	
	Nipped	—	—	—
100-seed weight	Branched	2.59–4.54	3.50 ± 0.38	
	Nipped	3.31–7.14	5.44 ± 1.06	9.24*
Total seeds/plant	Branched	234–899	539.1 ± 192.6	
	Nipped	215–715	464.0 ± 153.0	1.67
Seed yield in main head (g)	Branched	5.1–16.1	10.8 ± 3.0	
	Nipped	8.3–43.4	25.1 ± 9.1	7.94*
Seed yield in axillary heads (g)	Branched	1.7–18.4	8.1 ± 4.3	—
	Nipped	—	—	—
Yield per plant (g)	Branched	7.9–27.2	18.5 ± 6.2	
	Nipped	8.3–43.4	25.1 ± 9.1	3.20*
Oil content (%)	Branched	29.1–41.0	35.7 ± 3.2	
	Nipped	17.8–35.7	26.8 ± 5.1	6.68*
Oil yield/plant (g)	Branched	2.82–9.80	6.75 ± 2.08	
	Nipped	1.63–12.33	6.76 ± 2.62	NS

*Significant at 1% level.

branched plants did not differ significantly in germination. However, increase in shoot length (13.9 cm), seedling dry weight (34.2mg), and vigour index (2705.8) was observed in the nipped plants over the branched plants (10.7 cm, 21.6 mg and 2271.3, respectively) (Table 2).

Inducing the sunflower plants artificially to produce monoheads has greater significance in seed production programmes, particularly in breeder and foundation seed production. In the nipped plants, where only the main head is allowed to develop,

Table 2. Effect of nipping on seed germination and seedling vigour in RHA-274 line of sunflower

Parameter	Branched	Nipped	t value
Germination (%)	98.6 ± 2.3	95.8 ± 5.3	1.27
Shoot length (cm)	10.7 ± 2.2	13.9 ± 0.9	3.56*
Root length (cm)	12.3 ± 0.6	13.7 ± 1.7	2.01
Dry weight (mg)	21.6 ± 3.9	34.2 ± 4.9	5.34**
Vigour index	2271.3 ± 294.1	2705.8 ± 310.2	2.69*

*, **Significant at 5% and 1% levels, respectively.

synchronous maturity facilitates easy harvest. In addition, threshing time is also saved, because, threshing of the branched plants with small heads having fewer seeds is time consuming. Further, seed yield per plant also increased due to nipping, resulting into higher seed yield per unit area. Also, the test weight and vigour index were higher in the nipped plants, producing vigorous seedlings, leading to better establishment of plants [8–10], which is essential in seed production plots to maximize seed yield.

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