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# EXPLORING THE SCIENTIFIC BASIS OF PRUNING LEAF WEBBER-AFFECTED *SESAMUM INDICUM* L. BY LOCAL FARMERS TO ACHIEVE MAXIMUM POSSIBLE YIELD

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## ABSTRACT

The effects of pruning on growth of *Sesamum indicum* L. infected by leaf webber/capsule borer insect, *Antigastra catalaunalis*, is investigated in the field of a farmer in Khipro, Sindh (Pakistan). Sesame is a broad leaf annual summer crop. The disease does not appear during early stages of plant growth. Its out burst occurs during onset of monsoon season when plants are about three months old. Life cycle of *A. catalaunalis* is completed within 25 to 35 days after which chances of causing further infection are reduced. The local farmers neither provide proper fertilizers nor any insecticides against *A. catalaunalis*, due to their high cost. In stead, they prune the infected foliage at about three months of age to minimize the losses. The practice of pruning about upper 10 to 12 cm of disease-affected branches and main stem in our experiment resulted in not only increase in vegetative and reproductive growth but also minimized the severity of infection. The correct timing of pruning is, however, very important to get the better results. Yield in terms of seeds per plant was found to be higher in pruned as compared to the non pruned plants.

**Key-words:** Leaf pruning, *Sesamum indicum* L., yield.

## INTRODUCTION

*Sesamum indicum* L. (vernacular names - sesame, till; family - Pedaliaceae) is one of the most ancient seed oil crop grown in South East Asia which contain about 43.4– 58.8% oil in seeds (Tashiro, *et al*,. 1990). The sesame seed have tremendous nutrition value due to high concentration of protein which is about 22% (Khan and Sheikh 1985). This plant can be grown at high temperature, low water supply and other inputs (Ashri, 1998). It is successfully grown in tropical and sub tropic regions of the world under 28-32 ºC at well drained sandy loam soil. It is a drought resistant plant but much sensitive to salinity (Weiss, 2000). Its threshold salinity value is found to be $2.5 dS.m^{-1}$.

Sesame is an annual broad leaf crop grown in summer. It has white, bell shaped flower and opposite leaves. The stem attains the height of 150 – 180 cm. Seeds are present in a capsule which is about 2–3 cm long with four rows of seeds. The number of seeds varies from 60 – 80 per capsule depending upon the variety and health of the plant. The total area under sesame cultivation in Pakistan is 77.4 thousands hectare in the year 2010 – 2011, 31.3 thousand tones of seed yield (Federal Bureau of Statistics, 2010). In Sindh it is mostly grown in Sanghar, Chor, Umarkot, Dadu and Hyderabad. It is sown in mid of April or early May in Sindh (Pakistan) and harvested in mid of October. Sesame is used for making several traditional foods and its oil is used for cooking. The sesame oil extracted hey cake is used for stall feeding the cattle. It is also used as antioxidant in cosmetic industry. Its yield in Sindh is gradually lowering due to shortage of irrigation water, feeble seeds, inadequate fertilization, lack of pesticide application, priority given to cotton and drastic attack of leaf roller and capsule borer moth *Antigastra catalaunalis.*

The sesame crop is attacked mostly by insects and pests like leaf roller and pod borer, till gall fly, till Hawk moth and leaf hopper. Among them, leaf roller - capsule borer (*A. catalaunalis*) is most critical pest. Sesame leaf roller causes drastic damage to leaves of plant during vegetative growth and severely damages pod resulting low yield (Solanki *et al*., 2006).

The pest *(A. catalaunalis)* is white or off white in color. It generally completes its life cycle from 25-30 days. There is variation in duration of its life cycle with reference to season as it completes its egg to egg life circle in 23 days in summer and in 67 days in winter (Singh, 2002). The female lays about 140 eggs in night. The eggs are green in color and hatch within 2-7 days. Sesame leaf roller pod borer (*A. ctalaunalis*) caterpillars roll up young leaves, web them together with silk and live inside the rolled leaf. In addition to leaf damage the caterpillar also feed on flower and bore into fruits causing reduction in yield.

Chemical control of the moth is the application of methomyl or delta methanin with dimethyl medophast. Poverty of local farmers and lack of water compel them to grow sesame without using any insecticide and pesticide and even fertilizers without any irrigation, for their living. Other methods to control *A. catalaunalis* instead of chemical insecticides include crop rotation and intercropping. Intercropping may be a good method to combat the problem of pest and diseases (Ravimani *et al*., 1989). Sesame performs well when intercropped with groundnut or pearl millet (Murali *et al*., 1991). Some genotypes of *S. indicum* are considered less susceptible to infection and development of its eggs thus considered as resistant to this pest (Singh, 2002). Cultivation of resistant varieties is a better remedy to avoid the infection. Local farmers practice a different technique for the eradication of *A. catalaunalis*. They apply pruning of infectious plants which does not only eliminate the infected part of plant but also provide better yield due to increase in number of lateral branches and pods.

## MATERIALS AND METHODS

This experiment was conducted at the field of a local farmer located near water course No. 13 of Serle Branch, Khipro, District Sanghar, Sindh, Pakistan during the summer of 2008. The seeds were sown through broadcast on 15$^{th}$ May 2008 and the soil was irrigated by canal water before sowing. The plants were later not irrigated throughout the period of growth due to scarcity of canal water. The other source of water was rain. There were two heavy showers during growth period of crop one on 25$^{th}$ July and the other on 13$^{th}$ and 14$^{th}$ August. In order to verify the results under prevailing poverty of farmers any fertilizer and insecticides were not used for the whole period of crop. A plot measuring 40 x 60 ft with 600 plants, was divided into two - one half under went pruning and other half was not pruned at all (control).

Pruning was applied when the plants were about 3 months old and heavily infected by *A. catalaunalis*. The average height of plant before pruning was about 66 cm. The plants were decapitated by pruning at 10 to 12 cm from apex. The crop was harvested on 20$^{th}$ October 2009.The vegetative growth was measured in term of height of the plant and number of lateral branches where as reproductive growth was monitored on the basis of number of flowers and fruit, number and weight of seeds/fruit and number and weight of seeds/plant. The data presented is the average of 15 replicates selected randomly.

## RESULT AND DISCUSSION

The growth parameters of non pruned and pruned leaf webber- affected *Sesamum indicum* L. plants are presented in Table.1. All growth parameters at the age of 150 days in pruned plants were significantly higher than that in the non-pruned plants of the same age. The promotion in growth of 150-day old pruned plants over non-pruned plants is represented in Table 2. Vegetative as well as reproductive growth increased significantly on pruning. Maximum promotion after 60 days of pruning was observed in number of flowers, number of seeds and seed yield per plant (Table 2).

Pruning is practiced to increase number of branches and flowers in *Rosa damescena* (Rose) (Paul *et al*., 1995; and Hassanein, 2010) and leaf biomass in black tea (Revichandran, 2003). Pruning not only increases the height in tea plant but also increases the number of branches (Yilmaz *et al*., 2004). Heavily pruned *Prosopis juliflora* produce 60% more leaf biomass and yield of wood was increased six times as compared to non – pruned control (Elfadl *et al*., 2003). Pruning seems to have negative effect on apical dominance due to reduced auxin synthesis and temporarily increase in cytokinin supply (Saure, 1987). As compared to non–pruned plants the pruned plants are reported to carry better photosynthetic light reaction, produce large number of metabolism sink and a higher turgor pressure (Calatayud *et al*., 2008).

The correct timing of pruning is, however, important. The local farmer apply pruning before raining and they pruned the highly infected apical part of the *Sesamum indicum L.* plant. It is reported that leaf damage due to insect is 30.5% in the month of June and July. During August the leaf damage is dropped to 10% due to rainfall (Mahadevan, 1987). *A. catalaunalis* cause infestation of leaf, flower and capsule in about 30, 50 and 70 days after sowing respectively (Gupta, 2006). It could attack again but it is noticed that its affect is not severe after rains. Its incidence becomes moderate during September, October and November around 16% due to the onset of monsoons. The duration of their life cycle depends upon the season and the fecundity of female moth. In winter there is about 67 days to complete the life cycle as compared to 23 days in summer (Menon *et al*., 1960). The amount of foliar

diseases on non–pruned plant was found greater than pruned plants (Holb, 2005). As per our observations, sesame plants attained significant promotion in growth on pruning. The seed yield of the pruned plants was much higher.

Table 1. Some growth parameters of leaf webber affected non-pruned and pruned *Sesamum indicum* L. plant.

| **Growth Parameters** | **Non-pruned plants at the age of 90 days** | **Plants after pruning at the age of 90 days** | **Non pruned plants at the age of 150 days** | **Pruned plants at the age of 150 days** |
|---|---|---|---|---|
| Height (cm) | 66.11 ± 0.458 | 55.99 ± 0.654 | 87.81 ± 0.13 | 154.72 ± 1.57 |
| No. of Lateral branches / plant | 4.0 ± 0.1 | 3.867 ± 0.090 | 8.8 ± 0.13 | 12.8 ± 1.57 |
| No. of Flowers / plant | 13.33 ± 0.987 | 13.6 ± 0.289 | 22.2 ± 0.480 | 45.6 ± 0.877 |
| No. of Fruits / plant | 5.47 ± 0.636 | 4.4 ± 0.349 | 19.87 ± 0.60 | 33.2 ± 0.890 |
| No. of Seeds / fruit | 40.6 ± 0.305 | 43.2 ± 0.750 | 51.27 ± 0.556 | 65.33 ± 0.114 |
| No. of Seeds / plant | 220.53 ± 14.73 | 181.6 ± 14.77 | 1018.8 ± 33.33 | 2151.47 ± 41.5 |
| Weight of seeds / fruit (g) | 0.081 ± 0.00 | 0.086 ± 0.001 | 0.103 ± 0.001 | 0.131 ± 0.002 |
| Weight of seeds / plant (g) | 0.441 ± 0.029 | 0.363 ± 0.029 | 2.038 ± 0.06 | 4.303 ± 0.08 |

Table 2. Promotion in growth of pruned plants over non-pruned plants of *Sesamum indicum* L. at the age of 150 days.

| **Growth Parameters** | **Promotion (%)** |
|---|---|
| Height | 76.2 |
| Number of lateral branches / plant | 45.5 |
| No. of Flowers / plant | 105.4 |
| No. of Fruits / plant | 67.1 |
| No. of Seeds / fruit | 27.4 |
| No. of Seeds / plant | 111.2 |
| Weight of seeds / fruit | 27.2 |
| Weight of seeds / plant | 111.1 |

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