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Pinching Can Increase Faba Bean Yield and Yield Characteristics

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Pinching is done to affect canopy structure and is normally accomplished by removing the branch growing tip. Faba bean (Vicia faba L.) plays a role in biological fixation of aerial nitrogen, can be used to restore fertility in crop rotations, and is capable of satisfying its nitrogen requirements largely from the atmosphere. Its susceptibility to environmental conditions and biotic stress and instability of yield make it less attractive, and little is known about factors affecting growth and development. The experiment was conducted in a field from December 2010 to May 2011 to determine the effects of pinching on plant development and yield. Treatments were zero, one, two, and three pinchings. The first pinching was when plants had four true leaves. Second and third pinchings were when all lateral and sublateral branches had at least four leaves. At harvest, total seed and pod yield, number of pods per plant, pod weight, and number of lateral branches per plant were determined. Number of pods and shoots per plant, 100 seed weight, and pod and seed total yield were affected by treatment but not numbers of seed per pod and mean pod weight. Pinching two to three times produced more pods per plant and more pod and seed yields than not pinching. We propose pinching twice when plant main and lateral branches have four leaves to increase yield.

Keywords Vicia faba, Barkat, Broad bean, Canopy, Lateral branching, Pinching.

Faba bean (Vicia faba L.), sometimes known as broad bean, horse bean, or field bean, is a major food and feed legume because of the high nutritional value of its seeds, which are rich in protein and starch (Duc et al., 2010). Faba bean plays a role in the biological fixation of aerial nitrogen (Jelenić et al., 2000), can be used to restore fertility in crop rotations, and is capable of satisfying its nitrogen requirements largely from the atmosphere (Brunner and Zapata, 1984).

Unfortunately, susceptibility to environmental conditions and biotic stress and yield fluctuation has reduced its acceptance. It is grown in temperate to
Sowing date and irrigation affect faba bean yield (Al-Ghamdi and Al-Tahir, 2001; Salih, 1987). Plants grown on different dates are exposed to varying solar radiation and temperature during the season and this may influence efficiency of conversion of radiation to dry matter (Kiniry et al., 1989). Dry matter production of any crop is strongly correlated to amount of photosynthetically active radiation intercepted by the canopy (Kiniry et al., 1989; López-Bellido et al., 2005). Temperature can alter leaf area expansion and the amount of photosynthetically active radiation intercepted (Muchow and Carberry, 1989). One crop management technique that can influence amount of light intercepted is modification of canopy structure, lateral branch development, and duration of vegetative growth obtained by removing growing tips by pinching. Little is known of the effect of this practice on plant growth and yield. The objective was to determine the effects of pinching on faba bean yield and leaf and branch production.

MATERIALS AND METHODS

The experiment was conducted in a field at the University of Guilan Campus, Agriculture Faculty, Rasht, Iran (altitude 7 m below mean sea level, 37°16' N, 51°3' E), from Dec. 2010 to May 2011. The soil was a sandy loam, pH 7.4, containing total N (2%), total C (1.2%) and having a C/N ratio of 0.43. There was 4600, 1700, and 4000 mg kg⁻¹ of Ca, P, and K, respectively, in soil dry matter. The soil had an electrolytic conductivity (EC) of 0.08 dS cm⁻¹. The soil was prepared by plowing and disking. Seed of faba bean, cv. Barkat, were sown on 10 Dec. 2010 with a distance of 0.2 × 0.1 m between rows and plants.

A complete randomized block design with three replications was used. Treatments included zero, one, two, and three times of pinching by removing the tip of the growing branch. The first pinching was done when plants had four true leaves. The second and third pinching were done when all lateral and sublateral branches had at least four leaves.

At harvest, total seed and pod yield, number of pods per plant, pod weight, and number of lateral branches per plant were determined. Data were subjected to analysis of variance (ANOVA) in SAS (ver. 9.1, SAS Institute, Inc., Cary, NC). Means were separated using Tukey’s test.

RESULTS AND DISCUSSION

Numbers of pods and shoots per plant, 100 seed weight, and pod and seed total yield were affected by treatment (Table 1) but not number of seed per pod (average 8.45) and mean pod weight (20.15 g). Pinching affected responses (Table 2). Pinching one to three times did not affect number of pods per plant.
but pinching two to three times produced more pods per plant than not pinching. No pinching, or pinching once, produced similar numbers of pods per plant. No pinching, or pinching two or three times, produced among the highest number of shoots. Pinching once produced fewer shoots than pinching three times, and not pinching, or pinching twice, produced similar numbers of shoots. Not pinching, or pinching once or three times produced similar 100 seed weights. Not pinching, or pinching three times, produced 100 seed weights similar to pinching once or twice. Pinching two or three times produced more pod and seed yields than not pinching. Pinching once produced pod and seed yields similar to all other treatments.

Faba bean seed yield is the product of several components, including plant density, podding nodes per plant, seeds per pod, and mean seed weight (López-Bellido et al., 2005). Pinching two or three times increased number of seed pods and yield but not number of seeds per pod. Generally, by increasing the number of shoots per plant, the number of podding nodes per plant will increase (Barry and Storey, 1979), though number of seed per pod and mean seed weight tend to remain constant (Graf and Rowland, 1987; Seitzer and Evans, 1973).

Under most environmental conditions, number of pods per plant decreased with increasing plant density (Salih, 1989), whereas pinching increased the number of shoots per plant and number of pods per plant. The decrease in the number of pods per plant was due to reduced numbers of stems per plant, whereas pinching increased the number of branches (McEwen et al., 1988).
Adisarwanto and Knight (1997) found a strong correlation between seed yield and number of pods per plant. Seeds per pod are a component of yield that shows little variation across environments (Coelho and Pinto, 1989; Thompson and Taylor, 1977). We propose pinching twice when plant main and lateral branches have at least four leaves to increase yield.

REFERENCES


