Flowering Pattern and Abscission in Dry Beans *(Phaseolus vulgaris)* at two Locations in Brazil

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The expansion of dry beans (*Phaseolus vulgaris* L.) into the lowland Brazilian tropic with high temperatures reduces bean yield significantly. Luxury vegetative growth, flowering abscission, little pod setting are observed in farms and experimental fields. If water and nutrients are supplied adequately, high temperature is the only factor that differs this region from the main production region in the Southern part of the country. High temperature affects negatively bean yield as reported by Laing et al. 1984. Average day/night temperatures higher than 35/26.5 °C produced no mature pods (Stobbe et.al.,1966). Night temperatures higher than 27 °C reduced pod setting and increased flower buds formation, flowers and young pods abscission (Konsens *et al.* 1991). When water and high temperature stresses occurred at the same time, irrigation alone could not reduce the stress. In this tropical lowland, farmers produce around 600 kg ha^{-1} in the dry season, when the temperatures are milder and bean yield seldom passed 1500 kg ha in experimental stations without water stress.

The purpose of these experiments were to study the flower fall pattern over time to design the optimum planting date for the region.

The experiments were conducted in two locations: Embrapa Arroz e Feijão in Goiania-GO, 16° 28' 28.4''S ; 49° 17' 26.9''W with 700 m.a.s.l., planting date July 7, 2000; and Verdes Campos in Formoso do Araguaia, 11° 49'' S ; 49° 43'W, with 130 m a.s.l., planting date June 6, 2000. The average temperature of the two locations during the flowering period is shown in Table 1. Both experiments were conducted with irrigation during dry season, from May to September 2000. Twenty homogeneous plants of cv Ruda were selected and marked in the field in both locations. Labeling started from the first flower bud produced by the plant. Every day, small labels with dates and plant identification were hanged on every newly opened flower on all plants. In the following days the fallen labels were collected, and put in envelope, marked with date of the collection. The collection of the fallen labels continued until no labels were found on the ground, approximately 10 days after the last fallen label. The number of days between labeling and flower fall is called here "flower life". Total flower abscission, flower life (days of flower attached to the plant) and its distribution over the flowering period was calculated.

Table 1. Average temperature in each locations during the flowering period.

Month	June 2000			July 2000			August 2000		
Site	Max.	Min.	Mean	Max.	Min.	Mean	Max.	Min.	Mean
Peixe*	32.4	17.9	24.1	33.1	17.5	24.1	35.3	18.2	25.6
Goiania	28.7	13.7	20.8	28.9	13.2	20.8	31.2	15.0	22.9

* the closest weather station to the experimental field.

In both locations the differences among the maximum, minimum and average temperature were around 4 degree C and the highest temperature was far lower than 45° C; the maximum temperature occurring in many bean growing region, e.g., in the Central Valley of California. These small temperature differences were enough to produce significant yield differences between the two locations. Another unknown factor possibility played a great role for the yield differences. The total flower production in Goiania was more than 3 folds than in Verdes Campos, but the majority abscised within a few days. The method for labeling may oversee the recently formed flower buds, which died before could be tagged. The high percentage of

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pods with seed in Verdes Campos was due to the low number of the total flowers produced. The number of pod per plant was the same in both locations (Table 2). The highest number of flower abscission took place 12 DAFI in Goiania, and 19 DAFI in Verdes Campos (Figure 1-A). Flower life (number of days the flower is attached to the plant) declined the later the flowers were set. The flower life was longer at Verdes Campos than in Goiania (Figure 1-B). The bean yield at Verdes Campos was lower than in Goiania. One possible explanation to this may be greater expenditure of energy by the plants for having a longer flower life (maintain the flower attached to the plant, but later on abscised). Further evaluation is in progress to understand the critical period of the pod setting and pod development at the two locations.

Table 2. Total flower and pod setting and pod/flower ratio of 20 bean plants grown at two location.

Location	Total flower/plant	Pod/plant
Goiania	80.8	19.40
Verdes Campos	27.3	19.15

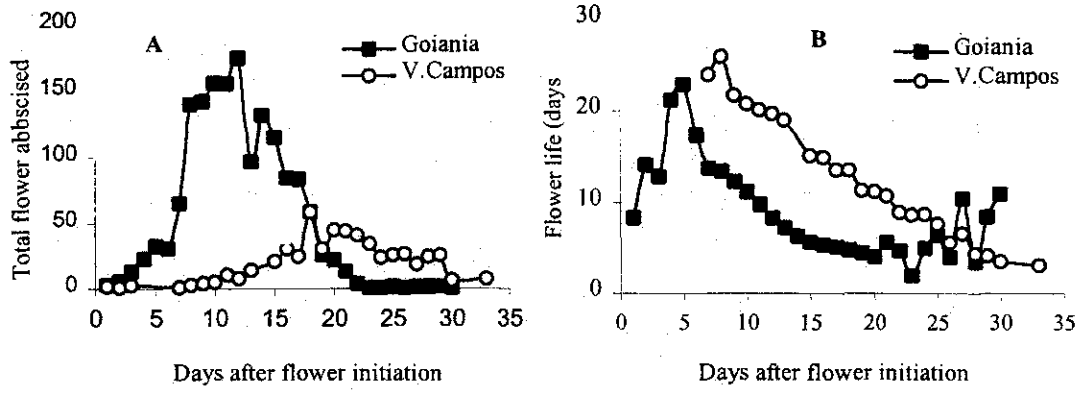

Fig.1. Total flower abscised during the flowering period (**A**) and number of days the flowers stay attached to the plants (**B**).

Literature:

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