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Effect of water stress and pruning on guava under HDP cv. Allahabad Safeda

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Abstract
The present investigation entitled "Effect of water stress and pruning on guava under HDP cv. Allahabad Safeda" was conducted at Fruit Research Station, Madhadibaug, College of Horticulture, Junagadh Agricultural University, Junagadh during April-2023 to December-2023. The experiment was laid out in Randomized Block Design (factorial concept) consisting of three levels of both water stress and pruning, which were replicated three times. The results revealed that growth parameters and flowering was significantly influenced by the various levels of water stress and pruning. Water stress at 15th May (W3) significantly increased number of flowers per shoot (14.04) in guava. Regarding pruning, the results were also recorded significant and maximum incremental plant height (0.52 m) and number of flowers per shoot (14.70) were recorded when pruning was done at 20 cm from the sky end (P3). For interaction effect, water stress at 15th May + 20 cm pruning from the sky end (W3P3) gave maximum number of flowers per shoot (17.46) in guava.

Keywords: Guava, pruning, water stress, flowering etc.

Introduction
Guava (*Psidium guajava* L.) belongs to the family "Myrtaceae" having chromosome no. 2n=22. It is a prolific bearer of high-quality fruits and is grown commercially in many tropical and subtropical areas of the world. The genus *Psidium* has about 150 species but only a few of them have horticultural value. It is also identified by the name "Apple of Tropics" and is one of the most common fruits grown in India. Following mango, banana and citrus, guava claims to be the fourth most important fruit crop in terms of area and production. It was introduced to India in the 17th century by the Portuguese (Menzel and Paxton, 1985) [18]. Guava has gained considerable prominence on account of its high nutritive and medicinal values and also has good aroma and flavor. It is a rich source of vitamin C, pectin, a moderately good source of iron, calcium, phosphorus and a very good source of dietary fiber. The presence of vitamin C and other phytonutrients such as carotenoids, iso-flavonoids and polyphenols in guava has led to it being an effective antioxidant. Apart from being relished as fresh fruit, guava is extensively used for making jelly owing to its high pectin content. It freezes exceptionally well and the products are practically indistinguishable from fresh fruits (Gopikrishna, 1979) [17]. Due to its hardy, prolific bearing and highly remunerative nature, it surpasses many other fruit crops. Moreover, this fruit can be grown satisfactorily even in adverse soil and climatic conditions.

In southern and western parts of India, there are three distinct flowering seasons in guava namely, Spring (*Ambe bahar*), Rainy (*Mrig bahar*) and Autumn (*Hasta bahar*) with corresponding harvesting periods in rainy, winter and spring respectively. The fruits produced in the rainy season are poor in quality, insipid, watery, insect infested and have a poor shelf life. Therefore, it is necessary to induce the plants to yield in the winter season which is superior in quality with good market demand. Because of good quality fruits, *Mrig Bahar* is most commonly taken all over the nation.

Continuous bearing results in the reduction of yield with small sized fruits. The heaviest flowering is observed in rainy season cropping, but the fruits of this season crop are rough, insipid in taste, poor in quality, less nutritive and are heavily attacked by many insects, pests, and diseases.

To overcome this problem and to force a full crop in any of the three seasons, as required by the grower and the traders, bahar treatment is practiced. The main objective of crop regulation is to force the tree to rest and produce profuse blossom and fruits during any one of the three flushes. The methods to be followed for crop regulation depend on climatic factors, cropping pattern, extend of the damage by the disease and pests, market and industry demand, cultivar, etc.

The rainy season crop in guava can be eliminated by removing current season growth through pruning, by giving water stress, by using some chemicals, plant growth regulators or by hand de-blossoming, etc. Whereas, hand de-blossoming is a cumbersome process and due to adverse effects on plants and human health chemical spray is not advisable for crop regulation. Hence, pruning and water stress can be good methods for the regulation of crop in guava in such a way that whole guava fruit will be harvested during November and before mid-December.

Giving water stress is an economic tool for crop regulation because it is not skilled work as compared to chemical sprays. The chemical method sometimes causes harmful effects on production, if the chemical is not sprayed at the appropriate stage and at the recommended concentration. Withholding irrigation is an easy method and also reduces extra irrigation costs in the summer season. Withholding irrigation significantly decreases yield during the rainy season and leads to higher yield during the winter season.

Pruning has become an essential operation to maintain the vigor of trees, fruit productivity and yield in guava. Moreover, annual pruning is needed to replace old and unproductive wood with new one. In unpruned trees, the old wood goes on accumulating every year and leads to a barren center, reduced productivity and poor fruit yield owing to shading and related problems. Therefore, in guava trees, it is an essential practice to maintain their vigor and productivity as well as to improve the fruit size and fruit yield. Apart from these pruning also leads to rejuvenation, better ventilation and higher sunlight penetration and creates feasible conditions for the application of plant protection chemicals (Bakhshi *et al.* 1997) [8].

Result and Discussion

An appraisal of data in table 1 and 2 shows the effect of water stress (15th April, 1st May and 15th May) and pruning (10, 15 and 20 cm from the sky end) on incremental plant height, days to flowering and number of flowers per shoot of guava.

Growth parameters

The effect of water stress on incremental plant height was observed non-significant. Pruning 20 cm (P3) of current season growth from the sky end significantly increased plant height (0.52 m). This might be due to increased allocation of nutrients absorbed by roots to main trunk of the tree due to pruning which increases vertical growth and increases height. The supply might be more in 20 cm pruning than 10 and 15 cm pruning from the sky end. Moreover, in pruned trees most of the carbohydrates and nitrogen were utilized for growth, thereby resulting in stimulated production of leader and lateral shoot. These results are in conformity with Singh *et al.* (2006) [20] and Basu *et al.* (2007) [11]. They also noted that plant height increased with the severity of pruning.

Flowering parameters

Both water stress (15th April, 1st May and 15th May) and pruning (10, 15 and 20 cm from the sky end) showed non-significant influence on days to flowering.

Water stress given at 15th May (W3) recorded significantly higher number of flowers per shoot (14.04). The lowest number of flowers per shoot (11.96) was observed in plants having water stress at 15th April (W1). Pruning 20 cm from the sky end (P3) recorded significantly the highest number of flowers per shoot (14.70). The lowest number of flowers per shoot (11.39) was observed under 10 cm pruning from the sky end (P1). The interaction effect of water stress and pruning at different levels in relation to number of flowers per shoot was found statistically significant. Significantly, maximum number of flowers per shoot (17.46) was noted in treatment combination of water stress at 15th May + 20 cm pruning from the sky end (W3P3). However, the minimum number of flowers per shoot (9.87) was recorded in treatment combination of water stress at 15th April + 10 cm pruning from the sky end (W1P1). This might be due to their combined influence on plant hormone dynamics and resource allocation. Water stress can trigger a response in plants to produce more flowers as a survival mechanism, while pruning redirects resources towards reproductive growth, stimulating the development of additional flower buds on each shoot. This combined approach optimizes the plant's reproductive potential, resulting in increased flower production per shoot during the rainy season. The present results coincide with the previous study of Singh, T. (2015) in guava.

Table 1: Effect of water stress and pruning on incremental plant height of guava.

Citation	Treatments	Incremental plant height (m)
Factor A – Water Stress		
W_1	15th April	0.45
W_2	1st May	0.46
W_3	15th May	0.47
S.Em.±		0.010
C.D. at 5%		NS
Factor B – Pruning		
P_1	10 cm	0.42
P_2	15 cm	0.44
P_3	20 cm	**0.52**
S.Em.±		0.010
C.D. at 5%		0.03
Interaction: W × P		
S.Em.±		0.017
C.D. at 5%		NS
C.V. %		6.31

Table 2: Effect of water stress and pruning on days to flowering and number of flowers per shoot of guava.

Citation	Treatments	Days to flowering	No. of flowers per shoot
Factor A - Water Stress			
W1	15th April	23.00	11.96
W2	1st May	23.56	12.41
W3	15th May	23.44	14.04
S.Em.±		0.563	0.289
C.D. at 5%		NS	0.82
Factor B - Pruning			
P1	10 cm	24.33	11.39
P2	15 cm	23.33	12.32
P3	20 cm	22.33	14.70
S.Em.±		0.563	0.289
C.D. at 5%		NS	0.82
Interaction: W × P			
S.Em.±		0.975	0.501
C.D. at 5%		NS	1.43
C.V. %		7.24	6.78

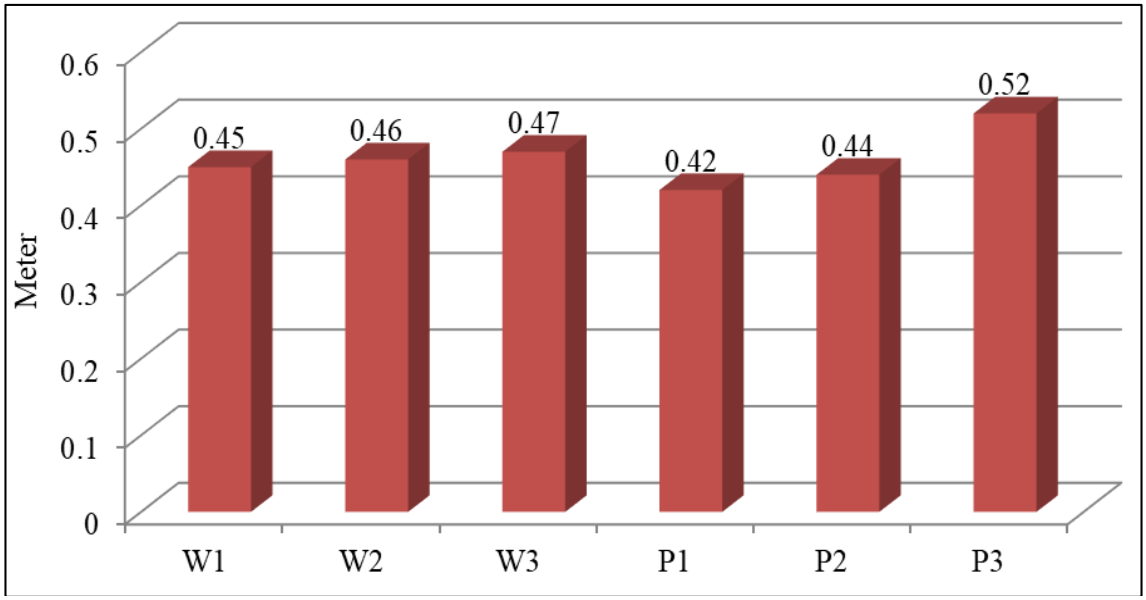

Fig 1: Effect of water stress and pruning on incremental plant height of guava.

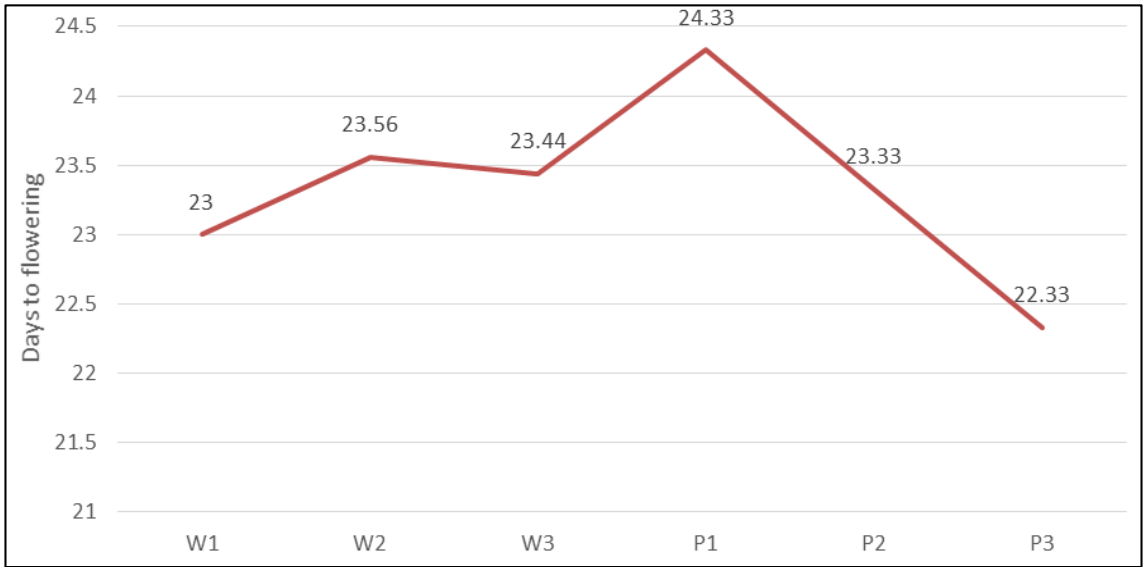

Fig 2: Effect of water stress and pruning on days to flowering in guava.

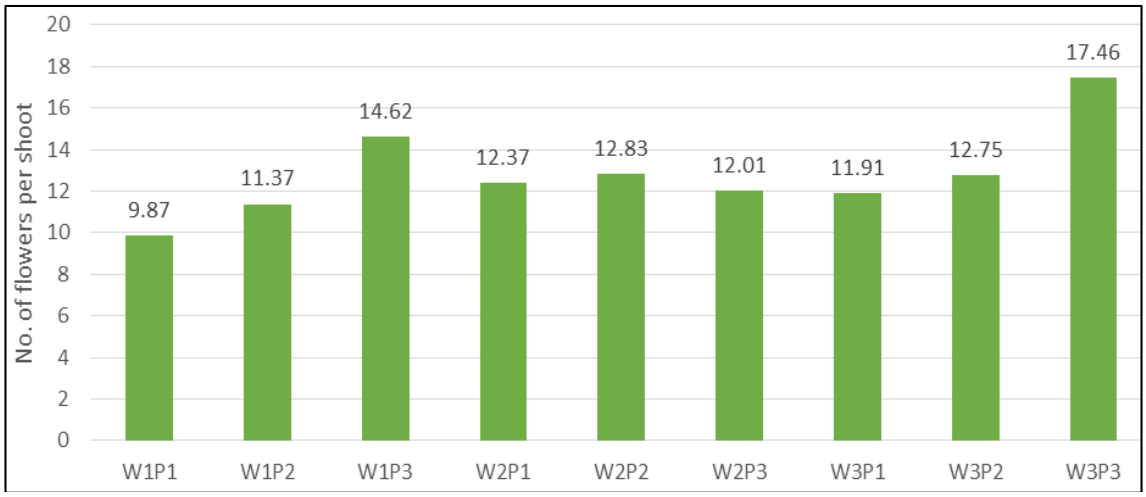

Fig 3: Interaction effect of water stress and pruning on no. of flowers per shoot of guava.

Conclusion

From the foregoing discussion, it appears reasonable to infer that there were notable differences in the outcomes of various treatments for growth and flowering parameters. It can be concluded that giving water stress at 15th May coupled with 20 cm pruning from the sky end (W3P3) gave maximum number of flowers per shoot.

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