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# EFFECT OF PINCHING IN VEGETATIVE AND REPRODUCTIVE ATTRIBUTES OF CHILLI (CAPSICUM ANNUUM L.)

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## ABSTRACT
Pinching promotes branching, which results in bushy growth and a more significant number of flowers, ultimately resulting in higher seed yield. An experiment was conducted to determine the effect of pinching on the vegetative and reproductive attributes of chili on farmer fields in the Lamjung district to study its effect on height, branching system, and yield of the plant. Seven treatments in total that is pinching at 25$^{th}$, 30th, 35th, 25th & 35th, 40th, and 25th & 40th DAT with three replications was laid out in randomized complete block design (RCBD). Out of the seven-treatment applied, pinching at 25DAT + 40DAT gave the best result in terms of yield, followed by another double pinching at 25DAT+35DAT. Single pinching at 40th DAT, 35th DAT, and 30th DAT was at par, while control treatment gave inferior results. A significant reduction in height was reported in the pinched plot than in the control. Similarly increase in the number of primary and secondary flowering branches was reported in the pinched plant as compared to the controlled condition. Pinched plants also reported maximum days to 50% flowering compared to the controlled condition. Among the pinched plants, double pinching takes a maximum of days to flower followed by single pinching, while control takes a minimum of days to flower.

## KEY WORDS
Pinching, flowering, yield, chili.

Chili is one of the important fruit vegetables or condiments (spice) belonging to the family Solanaceae. The total area occupied for chili production in Nepal is 9,687 hectares, with a production of 100,344 metric tons and a productivity of 10.35 MT/ha (MoALD, 2019). It is an integral component of every Nepalese kitchen. Every 100 gm of dry pods gives 160 calories of energy through 36 gm of carbohydrate, 18 gm of protein, and 16 gm of fat (Jagtap et al., 2012).

Chili has antioxidant, antimutagenic, and hypocholesterolemia properties (Bhattacharya et al., 2010; Morré & Morré, 2003). The genus Capsicum contains 20 species and five domesticated species: Capsicum annuum, frutescens, baccvatum, Chinese, and pubescent. The chili has been wildly grown in Brazil, which is considered to be the native home of chili (Thompson & Kelly, 1957). Capsicum annuum is a highly variable species in terms of morphology. The chili or red pepper, or hot pepper, is found on almost all plains throughout the country. Plants of chili can be herbs and shrubs that can reach up to 1-1.5 m tall. The plant has a prominence, and the fruit it produces is widely diverse in length, color, and degree of pungency. Despite belonging to the same species, Simla Mirch and chilies have different fruit characteristics, including size, shape, color, and pungency. When compared to Simla Mirch, the chili fruit size is smaller: yet, when it comes to pungency, it is more potent (Parajuli, 2015). The presence of the substance known as capsaicin is what causes the pungency.

Pinching is the process of removal of the apical bud along with a few leaves, which favors the growth of the number of side branches (Rajput et al., 2020). The main goal of pinching is to promote branching, which results in bushy growth and increases flower and seed production (B.C. et al., 2020). In many commercial flower crops, the effects of pinching have been documented as a significant reduction in plant height, a delayed flowering period, and an increase in the number of flowering stems (Dorajeerao & Mokashi, 2012; Kumar &

Singh, 2003; Malleshappa, 1984; Reiss-Bubenheim & Lewis, 1986). To pinch the top growth of the plant, the thumb and forefinger are used to do so. In Nepal, farmers mainly grow their chili on the roofs of their houses instead of in open fields. According to a 2013 study (Karungi et al., 2013), the earnings from the sale of chili contribute to the improvement of women's social status and poverty reduction. However, the yield of the chili is not sufficient to cover the demand of the local customer. Commercial cultivation has not yet flourished, and few commercial chili growers in Nepal are solely concerned with boosting yields through disease and nutrient management. But it might be advantageous to combine these yield-determination criteria with the pinching method. The yield primarily depends on the number of flowers, which in turn depends on the number and quality of blooming branches that can be enhanced by arresting the apical growth by pinching (Baskaran & Abirami, 2017).

The pinching method is unknown to the majority of farmers, and little study has been done on it. The relevance of pinching as a key yield determining factor may be significant. According to (Abbas, 2018), pinching has a considerable impact on plant height, flower diameter, stem diameter, flower count, and days to 50% blooming. In African marigolds, the quantity of lateral branches is associated favorably with flower production (Singh et al., 2019). African marigolds that were double-pinching produced the most flowers (Baskaran & Abirami, 2017).

Considering the lack of awareness among farmers about different crop management practices, especially about the pinching technique, the research was conducted. The main objective of this research was to identify the appropriate time for pinching chili and to maximize growth and yield.

## MATERIALS AND METHODS OF RESEARCH

The research was carried out in the farmer's field in Sundarbazar municipality in Lamjung district between February to June. It is situated 20 kilometers south of Besisahar, the district headquarters, and 175 kilometers west of Kathmandu, the capital. The site was situated between 28°03'19" to 28°30'38" north latitude and 84°11'23" to 84°38'10' east longitude.

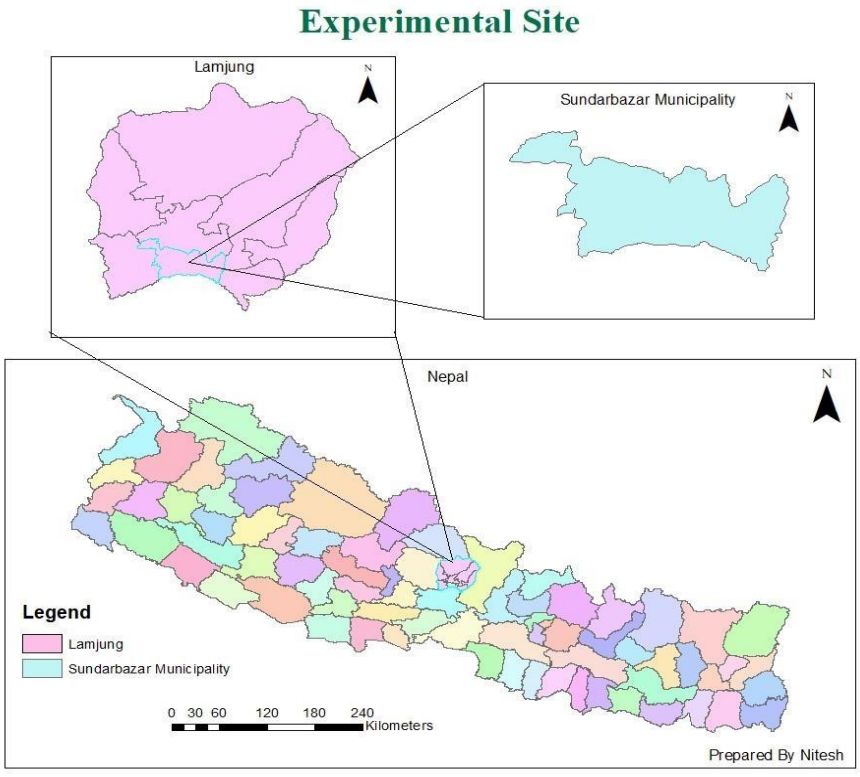


Figure 1 – Map of the experimental site

Lamjung has a subtropical climate with sub-humid weather, which includes a distinct rainy season as well as cold winter and scorching summer months. The minimum temperature goes up to 6-10°C during winter, and the highest temperature goes up to 25℃. The hottest month of the year is April, May, and June, when the maximum temperature rises to 39°C. Generally, it receives ample rainfall during the rainy season from June to September, whereas June and July receive the highest amount of rainfall. The average annual rainfall of this district is 2000 mm.

Chilly may readily be produced as summer, rainy, and winter season crops in the terai area of Nepal due to the timing of their planting, whereas they can be grown as summer and rainy season crops in the hilly region. On febraury15th, 2gm of Seed of NS1701 variety was disseminated at a depth of 4-5cm broadcast. After sowing, water was applied thoroughly by using a fine rose can, making sure that the soil was wet but not overwatered until the seedling emerged.

The planting material was cultivated in the RCBD design**.** The treatments were laid out in the block and replicated randomly. There were 21 plots in total, including three replications where the plots were spaced apart by 20 cm on each end for borderline effect and at a distance of 40 cm. The distance between the plants was maintained at 40cm, and row to row distance was also maintained at 40cm.

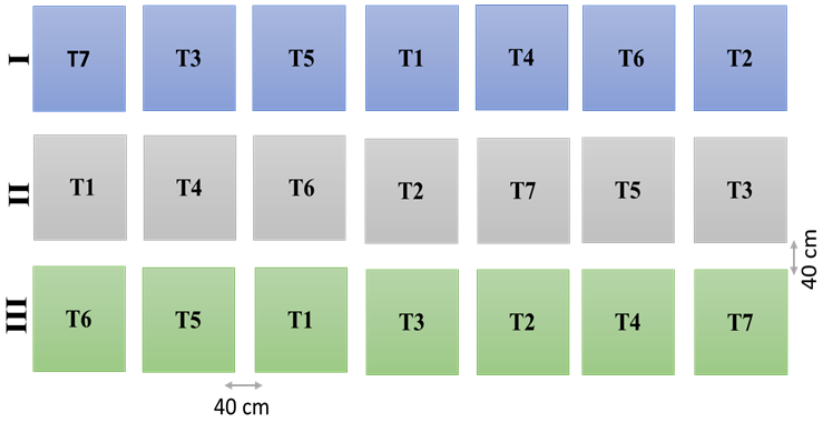


Figure 2 – Layout of the experiment field

Table 1 – Different treatments and their abbreviations used in the experiment

| Treatment | Treatment detail |
|---|---|
| T1 | Control (no pinching) |
| T2 | Pinching at 25 DAT |
| T3 | Pinching at 30 DAT |
| T4 | Pinching at 35 DAT |
| T5 | Pinching at 25 and 35 DAT |
| T6 | Pinching at 40 DAT |
| T7 | Pinching at 25 and 40 DAT |

Initially, the hand was sanitized using sanitizer, and equipment used in pinching was disinfected. The first pinching was done on the 25th day following transplantation, the second on the 30th day after transplantation, the third was done on the 35th day following transplantation, and the fourth was done on the 40th day after transplantation. Double pinching was done in two treatments, as the treatment which was pinched on the 25th day was re-pinched on the 35th and 40th day.

Initially, a tractor was used to prepare the field, and tiny clods were smashed using a spade. The layout was made before the transplantation. The first and light irrigation was given at the time of transplanting, and the subsequent irrigations were given at an interval of 4-5 days or once a week or 10 days, depending on the weather and soil moisture condition. The earthing up operation was done 20-21 days after transplanting to provide better anchorage to the plant. To maintain the optimum plant population in the field, gap filling was

done. A uniform and vigorous 40-day-old seedling of 3-4 leaves were chosen, and transplanting was done on the 30th of March in the main field in the evening, where irrigation was applied accordingly in a small amount. Nitrogen application at the rate of 120 kg/ha, 1/3 part as a basal dose, second 1/3rd in 25 days after transplanting, and last 1/3rd at 50 days after transplanting was done while phosphorus was applied as single super phosphate at the rate of 100 kg/ha. First, the wedding was done on the 19th of April, and the second weeding was done on the third week of May.

There were no chemical herbicides utilized. Attributes such as several primary branches, secondary branches, the height of the plant, days to 50% flowering, and yield of the plant were recorded at the time of harvesting.

All the observed and collected data were systematically arranged, compiled, and entered in MS Excel, and RStudio was used for data analysis. Statistical tools such as ANOVA were used to check significant differences between treatments and Least Significance Difference (LSD) at a 0.05 significant level was used to compare differences between treatment means.

## RESULTS AND DISCUSSION

Pinching had a notable effect on the number of primary branches and secondary branches. The greatest number of primary branches was reported on the 25th and 40th day of pinching, followed by pinching on 25th and 35th DAT, while the lowest number of branches was reported at control. Single pinching at 25 DAT, 30 DAT, 35 DAT, and 40 DAT were at par with each other.

Similarly, there was also a noteworthy effect on the number of secondary branches, as demonstrated in Table 2. The highest number of secondary branches was reported at 25th, and 40th DAT, followed by pinching at 25th and 35th DAT, but these two double pinching were on par with each other. A minimum number of branches were reported at control. Moreover, single pinching at 25th, 30th, 35th, and 40th DAT were at par. A similar observation was made by (Sunitha et al., 2007) on the number of primary branches.

Table 2 – Effect of pinching on the number of branches of the chili (capsicum annum)

| Treatments | No. of primary branches | No. of secondary branches |
|---|---|---|
| Pinching at $25^{th}$ and $40^{th}$ DAT | $10.33^{a}$ | $12.33^{a}$ |
| Pinching at $25^{th}$ and $35^{th}$ DAT | $8.33^{b}$ | $11.33^{a}$ |
| Pinching at $35^{th}$ DAT | $5.67^{c}$ | $8.33^{b}$ |
| Pinching at 40 DAT | $5.67^{c}$ | $7.67^{b}$ |
| Pinching at 30DAT | 5.33cd | $7.67^{b}$ |
| Pinching at 25DAT | 5cd | $7.33^{b}$ |
| Control (No pinching) | $4.33^{d}$ | $5.33^{c}$ |
| LSD | 1.1687* | 1.043* |
| CV | 10.38% | 6.902% |

The statistical difference between the treatments was extrapolated by one-way ANOVA in a randomized block; * = $p < 0.05$. The values with the same letter as a superscript do not differ statistically at $p < 0.05$ in Duncan's Test.

The results showed variation in the chili plant's height due to the pinching effect. The maximum height was found at control, followed by single pinching at 30th and 40th DAT, which were on par with each other. Minimum height was found at double pinching at 25th and 40th DAT, which was at par with pinching at 25th and 35th DAT. Reiss-Bubenheim & Lewis (1986) reported the effects of pinching in terms of a significant reduction in plant height, delayed flowering, and an increased number of flowering stems in many commercial flower crops, which is in line with the finding of this research. Majoka et al (2021) stated that control (no nipping) recorded maximum plant height as opposed to the nipping in cowpea due to the undistributed allocation of energy only to the apical part.

Pinching had a considerable difference ($p<0.05$) in days to 50% flowering. The highest number of days to 50% flowering was recorded at double pinching at 25th and 40th DAT

followed by pinching at 25th and 35th DAT. A minimum number of days to 50% flowering were reported in the control condition. Single pinching on different days was par with each other.

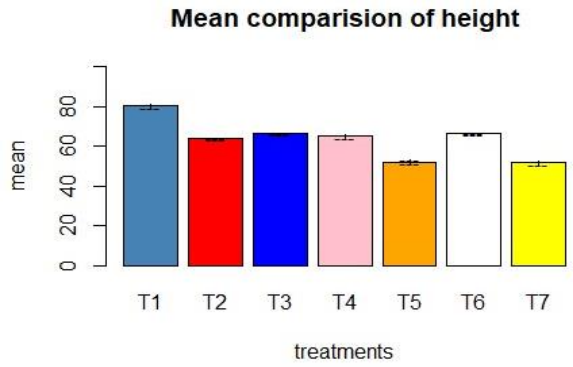


Figure 3 – Effect of pinching on height (cm) of chili

Moreover, there was significant variation in the yield of chili because of pinching. Maximum yield was obtained at 25th, and 40th DAT, followed by pinching at 25th and 35th DAT. Minimum yield was obtained in the control condition. Although single pinching on different days reported more yield than control, it was less as compared to double pinching. Pinching reported maximum yield due to the lateral movement of the auxin to the branches and increase concentration of the florigen that induces profuse (Dhital et al., 2017; Sunitha et al., 2007).

Table 3 – Effect of pinching on flowering and yield of chili (capsicum annum)

| Pinching | Days to 50% flowering | Yield (t/ha) |
|---|---|---|
| Pinching at 25$^{th}$ and 40$^{th}$ DAT | 60.33$^{a}$ | 17.83$^{a}$ |
| Pinching at 25$^{th}$ and 35$^{th}$ DAT | 58$^{b}$ | 16.5$^{b}$ |
| Pinching at 40DAT | 55.33$^{c}$ | 13.43$^{c}$ |
| Pinching at 25$^{th}$ DAT | 54.33$^{cd}$ | 12.13$^{d}$ |
| Pinching at 30$^{th}$ DAT | 54$^{cd}$ | 12.4$^{d}$ |
| Pinching at 35$^{th}$ DAT | 53$^{d}$ | 12.93$^{cd}$ |
| Control | 50$^{e}$ | 10.56$^{e}$ |
| LSD | 1.52* | 0.21* |
| CV | 1.57% | 5.729% |

The statistical difference between the treatments was extrapolated by one-way ANOVA in a randomized block; * = $p < 0.05$. The values with the same letter as a superscript do not differ statistically at $p < 0.05$ in Duncan's Test.

## CONCLUSION

The growth and yield of chili were significantly affected by pinching. Pinching promotes the number of flowering and the number of side branches. The maximum number of primary and secondary branches was recorded in double pinching at 25th and 40th DAT, followed by pinching at 25th and 35th DAT. Similarly, days to 50% flowering are reported maximum in double pinching and minimum in the controlled condition. Pinching also notably affects yield, which was accounted maximum in double pinching followed by single pinching.

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