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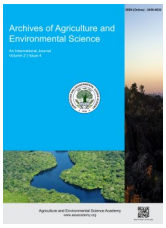

ORIGINAL RESEARCH ARTICLE

Effect of foliar spray of ethephon doses and pruning intensities on growth, sex expression, and yield of cucumber (var- Bhaktapur local) in Kaski, Nepal

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ABSTRACT

A field experiment was conducted to study the effect of foliar spray of ethephon doses and pruning intensities on the performance of Bhaktapur local cultivar of cucumber in Kaski, Nepal from Feb- May 2021. The study was laid out in Randomized Complete Block design (RCBD) with 2G and 3G cutting, and four different doses of ethephon (@125ppm, @250ppm, @375ppm @500ppm) as six treatments against control and were replicated four times with 28 plots each of 20.8 m^2 size having 4 rows with 4 plants per row. The data regarding plant height, leaf number, largest leaf area, days to 1st male and female flowering and fruit harvest, the total number of male and female flowers per plant, M: F flower ratio, fruit length, circumference, weight/fruit, fruit number per plant, fruit set % and yield were recorded and analyzed using MS-Excel and R-studio. The result revealed that growth and yield were significantly influenced by the levels of ethephon and pruning. Highest yield was recorded with ethephon @125ppm (83.54 t ha^{-1}) which is as par with 3G (72.57 t ha^{-1}) which was accompanied by a significantly higher number of fruits per plant {(125ppm=18.33), (3G=15.67)}, average fruit weight {(3G=674gm)}, (125ppm=608gm)}, and fruit set % {(3G=30.66 %)}, (125ppm=24.93 %)}. Significantly higher plant height (149.78 cm), and the highest number of leaves per plant (40) were recorded in control and Ethephon @125ppm at 50 DAT, respectively. The largest leaf area (626.84 cm^2) was recorded in 2G which is at par with 3G (613.31 cm^2) at 50 DAT. Higher dose of ethephon @500ppm (47.87 days) and 375 ppm (47.17 days) delayed days to 1st male flowering while all ethephon doses (T4=31.83 days, T5=32.5 days, T6=34.81 days, and T7=34.83 days) hastened female flowering than control and pruning. A significantly higher number of male flowers were obtained in the control (89.75), while the number of female flowers and M: F flower ratio increased with increasing ethephon level than in pruning (2G and 3G) and control. Hence, appropriate ethephon (125ppm) dose and pruning (3G) were highly conducive for better growth, sex expression, and yield of cucumber using Bhaktapur Local variety of cucumber in the hilly region of Nepal has a climatic condition similar to Kaski.

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INTRODUCTION

In Nepal, farming is more than just a means of subsistence; it's a way of life. The contribution of agriculture to the Gross Domestic Product (GDP) was 25.8% (2020/21) where vegetable alone contribute 9.7 % in national economy. Cucumber (*Cucumis sativus*), an annual trailing vine vegetable, of the family Cucurbitaceae is one of the most popular and widely cultivated throughout the world and is native to southern Asia (Adams *et al.*, 1992). Cucumber is used as edible tender pepo - freshly as a salad or as pickling (K. C. *et al.*, 2019), fruits

containing 93-95% of water. The production and productivity of cucumber in Nepal is almost less than half of the world's average productivity (FAOSTAT, 2018). Cucumber is also known for its promising cheap source of the nutrient. The day-by-day increased demand for cucumber in Nepal goes on increasing due to the increase in population but the production isn't enough to meet the demand and have to import from other countries mainly China and India. Production of a higher number of male flowers than that of female flowers i.e., (female: male ratio - 1:15 to 1:13), lower fruit set, lack of parthenocarpic cultivar/variety, deformed fruits, etc. causes lower productivity (Mangave *et al.*, 2017; Subedi *et al.*, 1997). For increasing the production of cucumber, the use of PGR_S and pruning could be the best alternatives. It plays an important role in modifying morphological attributes (plant height, number of leaves per plant, leaf area, etc.), phonological attributes, and yield attributing characteristics of the plant.

Sex expression in cucumber directly affects yield. Cucumber is a generally monoecious plant but can be unisexual or bisexual. Cucurbits produce separate male and female flowers in different locations on the same plant where only female flowers bear fruit. The first flowers flowering near the base of the plant are male flowers. Female flowers with fruit at a base appear about a week after the male flower appeared**.** The appearance of a male or female flower is closely related to genetics as well as chemical and environmental conditions (Arpan *et al.*, 1974). Male flowers develop mostly on the main stem earlier (nodes 1 -9), which is followed by alternate male and female flowers and finally more numbers of female flowers (Tasdighi and Baker, 1981). In cucumber, low fruit set, higher male flower, and lower female flowers and small-sized fruit of the sets fruit which will deteriorate in mother plants are major problems. So, pruning is quite common to maintain the balance between vine growth and fruit production and to increase the yield of cucumbers. (Usenik *et al.*, 2008) reported that pruning has a direct effect on vegetative growth and quality of fruit with no negative effect. Pruning in cucurbits includes 1G, 2G, and 3G, where G refers to the generations of branches. (Beadle *et al.*, 2007) reported that pruning will reduce the number of branches, increasing the light availability which affects plant development directly (Feng *et al.*, 2008).

Similarly, PGRs like Ethephon, GA_3, and NAA have gained immense popularity to increase the productivity of fruits and vegetables, but the right way and right dose of application of PGR are yet to be precisely determined causing the lower in production. It influences plant vegetative characteristics, sex expression, and flowering. Female: male flower ratio in cucumber may vary up to 1:15 to 1:13, which can be minimized by mechanical and chemical methods (Pandey *et al.*, 2019). Low male: female flowers, lower fruit set, etc. causes lower productivity (Mangave *et al.*, 2017). **(**Arora *et al.*, 1994) reported that exogenous application of ethylene is effective to alter the sex expression in cucumbers by increasing the number of female flowers and suppressing the production of male flowers. (Papadopoulou and Grumet, 2005) and **(**Özgür *et al.*, 2004) both reported similar findings in cucumber than in control. Therefore, this experiment was carried out to assess the effectiveness of different ethylene concentrations and intensities of pruning on the performance of cucumber Kaski, Nepal.

MATERIALS AND METHODS

Experimental site

The experiment was conducted at a farmer's field located at Kaski, Nepal from Feb- May 2021, situated at an altitude of 763 masl - longitude of 84^0 01' E and latitude of 28^0 11' N (PMAMP, 2020). The soil of the experiment site was slightly acidic ($_P$H 6.7), medium organic matter (2.81%), medium N (.014%), high P (101.36 Kg/ha), and high K (474.25 Kg/ha). The experiment site lies in the sub-tropical zone of Nepal.

Experiments design and treatments

The experiment was laid out in Randomized Complete Block Design (RCBD) with 7 treatments consisting of 4 levels of ethephon (125 ppm, 250 ppm, 375 ppm, and 500 ppm) and 2 levels of pruning (2G and 3G cutting) against control with 4 replications under hail-net protected bamboo tunnel condition with 28 experimental units each 20.8 m^2 containing 4 rows with 4 plant each with the spacing of 1.3 m* 1 m between row to row and plant to plant respectively.

Preparation and spray of ethephon

Different doses of ethephon prepared in the laboratory were applied twice i.e., at 2 and 4 true leaf stages along with sticker (surfactant) to increase the effectiveness of its application. The stock solution of ethephon was first prepared by dissolving the weighted amount of chemicals and adding the required quantity of distilled water. The solution of various concentrations of ethephon was prepared at the time of foliar application at various growth stages. Only the freshly prepared solutions have ethephon 39% S.L- a commercial form of ethephon. Initially, 1000 ppm of stock solution was prepared and was diluted to 125 ppm, 250 ppm, 375 ppm, and 500 ppm using distilled water.

Pruning

Pruning intensities in cucurbits vary as 1G, 2G, and 3G, where G refers to the generations of branches in plants. To balance the vegetative character and fruit number plants of two plots from each replication were pruned up to 2G and 3G. The main branch after it germinates is the 1^{st} generation branch which is allowed to grow up to 5-6 ft, and the branch which grows from the main branch is referred to as the 2^{nd} generation branch, which gives 3^{rd} generation branching. Pruning up to 2G and 3G helps promote the growth of secondary and tertiary branches excluding the primary branches in 2G and 1^{st} and 2^{nd} branches in 3G.

Statistical analysis

The various data obtained were statistically analyzed using R-

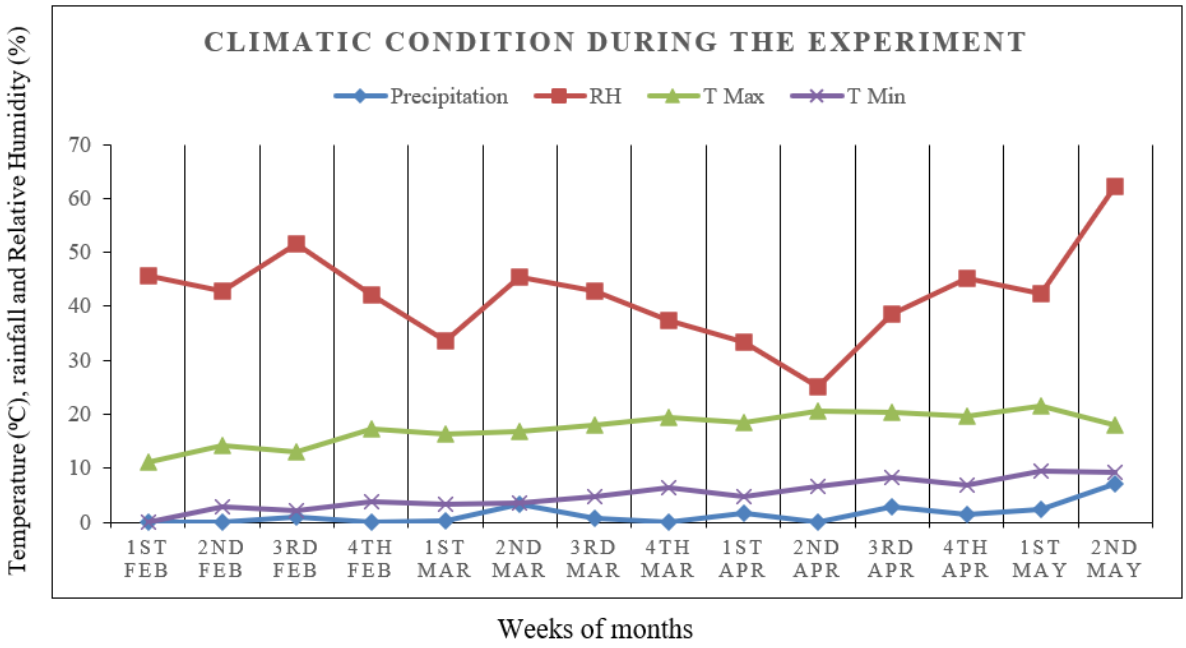

Figure 1. *Weather data of experimental site at Arambha Krishi farm from Feb to May 2021 Source: (NASA POWER, 2021).*

studio 1.4.1717 to find out the statistical significance. The means for all the treatments were calculated and the analysis of variance for all the characters was performed by the 'F' (variance ratio) test. The significance of the difference among the means was evaluated by Duncan's Multiple Range Test (DMRT) by (Gomez and Gomez, 1984) for interpretation of the result at a 5% level of probability.

RESULTS AND DISCUSSION

Plant height and leaf number

The plant height of the cucumber was significantly influenced by both the application of ethephon and pruning. With the increase in ethephon dose plant height decreases (Table 1). At 30 DAT, the highest plant height recorded in control (38.47 cm) which is as par with 3G (40.58 cm), and plant height at ethephon @500 ppm was found minimum (29.56 cm). The application of different doses of ethephon and pruning showed significant differences in plant height of cucumber in all data recorded at 40 DAT and 50 DAT. (Hayashi *et al.*, 2001) reported that the anti-gibberellic property of ethylene causes cessation of miotic processes in the meristem of root and shoot, which affects the length of the plant and it might be the reason for the reduction of in plant height with increasing in ethephon doses. IAA transport is also inhibited by ethylene in plant systems, inhibiting the elongation as reported in (Morgan and Gausman, 1966; Malloch and Osborne, 1976). Ethephon @5000 ppm was found to be lethal as it causes the death of all plants (Bhandary *et al.*, 1974). During the initial phase of plant growth, some injury symptoms and yellowing were also seen in this research. (Shivaraj *et al.*, 2018) and (Suthar *et al.*, 2007) both reported that exposure to light conditions increases the vine length due to the diversion of nutrients to the main shoot and greater photosynthesis activities.

No significant differences were observed in the number of leaves per plant at 30 DAT. At 40 DAT at ethephon @125, 250, 375, and 500 were found statistically as par with control while leaf number per plant is less in pruned plant in both 2G (13.06) and 3G (14.13). A similar, result was also obtained from data recorded at 50 DAT. The increased number of leaves per plant in ethephon-treated plants may be due to a reduction in the internodal distance in cucumber which is also observed by (Choudhury and Singh, 1970).

Largest leaf area

No significant differences were observed in the largest leaf area in both pruning and ethephon doses at 30 DAT in the experiment in Table 2. During 40 DAT largest leaf area of cucumber plants with both pruning levels i.e., 2G (359.96 cm^2) and 3G (361.14 cm^2) were found statistically as par with each other and with an increase in ethephon concentration from 125 ppm to 500 ppm largest leaf area started decreasing. The smallest leaf area was found with ethephon @500 ppm (192.78 cm^2) among all treatments at 40 DAT. A similar result was also obtained at 50 DAT with the largest leaf area of the cucumber plant: better interception of sunlight into the canopy structure might result in the largest leaf area of pruned cucumber as reported by (Shivaraj *et al.*, 2018; Hao *et al.*, 2010) in pruned cucumbers.

Days to first male and female flowering, fruit harvest, and number of flowers

Days to first male flower appearance increased with increasing level of ethephon, as maximum days to first flowering was obtained with ethephon @500 ppm (47.87 days) which is as par with 375 ppm (47.17 days). Earlier male flowering was seen in ethephon at 250 ppm (39.27 days) which is as par with 2G (37.92 days) Thus, increasing the dose of ethephon delayed the appearance of male flowers. Similarly, earlier female flowering was found with ethephon @125 ppm (31.83 DAT) which is as

Table 1. Effect of foliar spray of ethephon doses and pruning on plant height (cm) and leaf number of cucumber cv. Bhaktapur Local in Kaski, 2021.

Treatments	Plant height (cm)			Leaf Number		
	30 DAT	40 DAT	50 DAT	30 DAT	40 DAT	50 DAT
Control	38.47^{a}	95.75^{a}	149.78^{a}	8.63	22.18^{a}	39.31^{a}
2G	30.54^{bc}	66.23^{bc}	91.48^{bc}	8.68	13.06^{b}	24.71^{b}
3G	40.58^{a}	79.0^{abc}	102.19^{bc}	9.44	14.13^{b}	27.19^{b}
Ethephon @125ppm	36.13^{ab}	83.68^{ab}	127.04^{ab}	8.81	22.33^{a}	40.0^{a}
Ethephon @250ppm	31.87^{bc}	69.52^{bc}	111.98^{bc}	9.38	23.66^{a}	38.31^{a}
Ethephon @375ppm	30.13^{bc}	58.43^{c}	86.70^{c}	8.94	22.63^{a}	37.18^{a}
Ethephon @500ppm	29.56^{c}	56.93^{c}	83.98^{c}	8.44	24.08^{a}	39.10^{a}
SEm (±)	0.73	2.55	3.62	0.15	0.55	0.94
F Probability	0.003	0.007	0.001	ns	5.367e-05	0.0009
LSD (=0.05)	5.73**	20.03**	28.43**	1.2	4.3***	7.41***
CV, %	11.38	18.52	17.79	9.12	14.27	14.2
Grand mean	33.9	72.80	107.6	8.9	20.3	35.13

Table 2. Effect of foliar spray of ethephon doses and pruning on largest leaf area (cm^2) of cucumber cv. Bhaktapur Local in Kaski, 2021.

Treatments	Largest leaf area (cm^2)		
	30 DAT	40 DAT	50 DAT
Control	195.46	284.06^{ab}	454.34^{b}
2G	172.74	359.96^{a}	626.87^{a}
3G	207.62	361.14^{a}	613.31^{a}
Ethephon @125ppm	173.75	1206.36^{bc}	375.42^{bc}
Ethephon @250ppm	158.37	228.56^{bc}	357.66^{bc}
Ethephon @375ppm	167.18	194.56^{c}	321.61^{c}
Ethephon @500ppm	150.51	192.78^{c}	319.74^{c}
SEm (±)	7.32	9.88	14.81
F Probability	ns	0.00023	2.76e-05
LSD (=0.05)	57.56	77.67***	116.40***
CV, %	22.13	20.02	17.87
Grand mean	175.09	14.19	18.54

par with ethephon @250 ppm (32.5 DAT), ethephon @375 ppm (34.81 DAT), and ethephon @500 ppm (34.83 DAT) and later flowering was found in control (45.25 DAT) which is as par with 2G (44 DAT), which signifies that higher the ethephon doses earlier the female flowering than pruning levels (3G, 2G) and control. Early flowering may be due to the highest plant height, and largest leaf area which supplemented assimilates required to promote early flowering as reported by (Shivaraj *et al.*, 2018) and (Suthar *et al.*, 2007). (Choudhury and Singh, 1970) reported that ethephon treatment increases the starch and carbohydrate resulting in the earliest production of female flowers in cucumber. In the primordial stage, all flowers carry both sets of sex organs, and the application of certain chemicals can transform male flowers into female flowers (Ito *et al.*, 1954).

A significantly maximum number of male flowers was recorded with control (80.25) which is followed by 2G (54.25), 3G (41.25), and ethephon @500 ppm (11.25) has a minimum male flower number than other treatments. Male flower number decreases with increasing ethephon doses whereas the least number of male flowers were obtained with the highest dose of ethephon at 500 ppm (11.25). Significantly, the highest number of female flowers were obtained with ethephon @500 ppm (86.5) which is as par ethephon @ 375 ppm (85.25), while several female flowers with 2G (32.25) were found to be smallest which is par with control (37). M: F flower ratio was also significantly influenced by both pruning and ethephon doses, a higher M: F flower ratio was obtained in control (6.75) whereas, the lowest M: F flower ratio was found with ethephon @ 500 ppm (0.85) in cucumber. Ethylene act a dual role in sex determination and subsequent maturation of carpel in cucurbits as reported by (Little *et al.*, 2007). (Bhandary *et al.*,1974) study on cucumber found that increase in female flowers and a decrease in male flowers which results in lowering the lower sex ratio with the application of different ethephon doses. (Rudich *et al.*, 1972) also obtained similar findings with the application of different ethephon doses in cucurbits. The reason for the earliest female flower production in cucumber may be due to the maximum increase in starch and carbohydrate with ethephon-treated plants (Singh *et al.*, 1984).

Fruit quality and fruit set (%)

Significantly highest fruit length was obtained in the control (24.6 cm) which is as par with 2G (24.45) followed by ethephon @125 ppm (24.04 cm) and 3G (23.33 cm) and the lowest fruit length was recorded with ethephon @500 ppm (17.33 cm).

Table 3. Effect of foliar spray of ethephon doses and pruning on days to first male and female flowering, first fruit harvested of cucumber, on several flowers, and M: F flower ratio cv. Bhaktapur Local in Kaski, 2021.

Treatments	Days after transplanting			Number of flowers		
	Male flowering	Female flowering	First Harvest	Male	Female	M: F ratio
Control	36.06^{b}	45.25^{a}	60.00	80.25^{a}	37.00^{c}	6.75^{a}
2G	37.92^{b}	44.0^{a}	63.25	54.25^{b}	32.25^{c}	4.56^{b}
3G	36.0^{b}	40.31^{b}	60.25	41.25^{c}	57.00^{b}	2.66^{c}
Ethephon @125ppm	36.94^{b}	31.83^{c}	58.50	46.50^{c}	71.25^{ab}	2.61^{c}
Ethephon @250ppm	39.27^{b}	32.5^{c}	58.00	23.25^{d}	76.25^{ab}	1.81^{d}
Ethephon @375ppm	47.17^{a}	34.81^{c}	60.25	13.0^{e}	85.25^{a}	1.08^{e}
Ethephon @500ppm	47.87^{a}	34.83^{c}	58.00	11.25^{e}	86.50^{a}	0.85^{e}
SEm (±)	0.27	0.22	0.70	0.76	2.49	0.07
F Probability	0.0007	3.94e-09	Ns	1.8e-14	0.0002	4.6e-13
LSD (=0.05)	5.85***	4.16***	5.48	11.04***	19.56***	0.6***
CV, %	9.81	7.43	6.17	10.37	20.7	14.02
Grand mean	40.17	37.73	59.75	38.54	63.64	2.9

With the increase in ethephon doses the fruit length decreases. (Dhakal *et al.*, 2019) also reported similar findings in the case of cucumber fruit length with ethephon different concentrations. However, (Carine Cocco, 2021) reported that different doses of ethephon application and fruit length didn't vary statistically in plums which contradicts our findings with them. While fruit circumference of cucumber was found highest with 3G (22.80 cm) which is as par with ethephon @125 ppm (20.92 cm) while all other treatments were as par with each other and the lowest cucumber fruit circumference was obtained with ethephon @500 ppm (18.90 cm). Increasing the dose of ethephon from 125 ppm to 500 ppm circumference of the fruit decreases significantly which contradicts with findings of (Dhakal *et al.*, 2019). (Carine Cocco, 2021) reported fruit circumference has not varied statistically among treatments, with exception of ethephon @100ppm. Similarly, 2G (38.19%) has a significantly higher fruit set percentage which is on par with 3G (30.66%), that might be due to maximum leaf area which led to enhanced photosynthesis and its accumulation as reported by (Shivaraj *et al.*, 2018), while lowest fruit set % was obtained with ethephon @500 ppm (15.12%).

Yield, yield parameters, and B: C ratio

The weight of cucumber fruit under 3G (674 gm) and the weight of cucumber fruit treated with ethephon @125 ppm (608 gm) were statistically at par with each other and superior to other treatments. (Shivaraj *et al.*, 2018) also reported that the fruit weight of cucumber also increased by pruning. Successful pruning provides an appropriate balance between fruit number and its size leaving a suitable number of branches on the plant, the decreased number of shoots improves the quality of fruit as reported (Aydin *et al.*, 2020). Also, pruning cucumber decreases the number of shoots and improves the fruit quality (Cebula, 1995). While lowest fruit weight was obtained with ethephon @500 ppm (405.5 gm) which is as par with ethephon @375 ppm and control with both 425.5 gm of fruit weight followed by ethephon @250 ppm (460 gm). With the increasing dose of ethephon the fruit weight decreases. Similarly, the highest number of fruits per plant was obtained with ethephon @125 ppm (18.33) which is at par with 3G (15.67), whereas the smallest number of fruit number per plant was obtained with control (11.88) which is at par with ethephon @500 ppm (12.25), followed by 2G (12.44) which is as par with ethephon @375 ppm (12.88). With the increasing dose of ethephon the fruit number per plant decreases. According to (Choudhury and Singh, 1970) fruit number of cucumber seedlings increases twice with ethephon @100-150 ppm than in control. The yield of cucumber under different treatments is presented in Table 5. Ethephon @125 ppm (83.54 t/ha) was found superior in terms of yield which is as par with 3G (72.57 t/ha) whereas, the lowest yield was obtained under ethephon @500 ppm (38.12 t/ha) which is as par with control (38.84 t/ha). The increment in yield of cucumber is due to the increase in pistillate flowers, fruit weight, circumference, diameter, and several fruits per plant as shown in Tables 4 and 5. (Zende, 2008) observed with the increase in the intensity of pruning its size, diameter, and average weight of fruit increases because the ratio of leaf to fruit is higher than the less pruned plants. (Carine Cocco, 2021) justified that, treatments with ethephon and temperature above 25°C intensify ethephon action and had higher fruit yield. The increase in yield may be attributed to ethephon which plays an important role in growth and differentiation in sink strength as reported by (Patrick, 1982). Similarly, (Choudhury and Singh, 1970) reported that the fruit yield of cucumber seedlings yielded thrice with ethephon @100-150 ppm and twice with ethephon @50-100 ppm as control. Similarly, pruning results in better fruit yield as reported by (Hao *et al.*, 2010). B: C ratio was significantly influenced by pruning levels and ethephon doses. The highest (4.94) B: C ratio was obtained in ethephon @125 ppm while the lowest (2.25) B: C ratio was obtained in ethephon @500 ppm which is as par with control (2.32). B: C ratio decreased as the ethephon level increased.

Table 4. Effect of foliar spray of ethephon doses and pruning on fruit quality of cucumber cv. Bhaktapur Local in Kaski, 2021.

Treatments	Fruit Quality		
	Length (cm)	Circumference (cm)	Fruit Set %
Control	24.6^{a}	19.98^{b}	35.97^{a}
2G	24.45^{ab}	20.48^{b}	38.19^{a}
3G	23.33^{ab}	22.80^{a}	30.66^{a}
Ethephon @125ppm	24.04^{ab}	20.92^{ab}	24.93^{ab}
Ethephon @250ppm	21.54^{bc}	19.03^{b}	17.45^{b}
Ethephon @375ppm	19.14^{cd}	19.03^{b}	15.41^{b}
Ethephon @500ppm	17.33^{d}	18.90^{b}	15.12^{b}
SEm (±)	0.35	0.24	1.56
F Probability	0.0007	0.004	0.002
LSD (=0.05)	2.71***	1.90**	12.28**
CV, %	8.27	6.34	32.58
Grand mean	22.06	20.16	25.39

Table 5. Effect of foliar spray of ethephon doses and pruning on yield parameters and B: C ratio of cucumber cv. Bhaktapur Local in Kaski, 2021.

Treatments	Fruit			B: C
	Weight/fruit (gm)	Number/plant	Yield(t/ha)	
Control	425.5^{c}	11.88^{c}	38.84^{c}	2.32^{c}
2G	560.88^{b}	12.44^{c}	52.68^{b}	2.55^{c}
3G	674^{a}	15.67^{ab}	72.57^{a}	4.14^{b}
Ethephon @125ppm	608^{ab}	18.33^{a}	83.54^{a}	4.94^{a}
Ethephon @250ppm	460^{c}	13.33^{bc}	45.59^{bc}	2.69^{c}
Ethephon @375ppm	425.5^{c}	12.88^{c}	43.53^{bc}	2.57^{c}
Ethephon @500ppm	405.5^{c}	12.25^{c}	38.12^{c}	2.25^{c}
SEm (±)	12.19	0.31	1.51	0.07
F Probability	0.00004	0.0005	5.6e-07	3.7e-07
LSD (=0.05)	95.82***	2.43***	11.90***	11.90***
CV, %	12.67	11.88	14.96	14.96
Grand mean	508.5	13.75	53.55	3.07

Conclusion

Plant height decreased with an increasing level of ethephon at all dates of observations. The plant under control was superior to both pruning and ethephon application for most of the data of observation. Leaf number was found to be greater in ethephon application than in pruned cucumber plants. The largest leaf area decreases with increasing ethephon doses while pruned cucumber plants have greater leaf area compared to ethephon application. Days to 1st male flowering delay with increasing ethephon doses while in pruning intensities days to 1st male flowering was earliest as compared to ethephon doses. Days to 1st female flowering was earliest in ethephon application than pruned ones. The number of male flowers per plant decreased while the number of female flowers increased with the increasing level of ethephon. While pruning decreased the number of male flowers than control but increases the number of male flowers than ethephon applied plant whereas the number of female flowers was less in pruned than in ethephon applied cucumber plants. Control has the highest M: F flower ratio followed by pruning intensities (2G and then 3G) and increasing ethephon doses from 125 ppm to 500 ppm. M: F flower ratio per plant decreased with increasing ethephon doses. Average fruit length was highest at control which was statistically similar to 2G, 3G, and ethephon @125 ppm. Average fruit circumference was highest under 3G which was statistically similar with ethephon @125 ppm. The highest fruit set % was obtained with 2G followed by control and 3G. Average fruit weight was highest with 3G which was statistically similar to ethephon @125 ppm. Similarly, in the case of the number of fruits per plant highest fruit per plant was at ethephon @125 ppm. The highest fruit yield was obtained from ethephon @125 ppm which was statistically similar to 3G whereas increasing in ethephon doses from 125 ppm – 500 ppm yield significantly decreased. Economically, ethephon @125 ppm was found to be better than other treatments in terms of the B: C ratio. In conclusion, using ethephon @125ppm and 3G helps in better performance of cucumber. Most of the observed parameters were found to be influenced by ethephon concentrations and pruning intensities. Among various treatments application of ethephon @125 ppm and 3G, both resulted in better vegetative growth, fruit weight, number of fruits per plant, and overall yield compared to treatments. Increasing ethephon doses from 125 ppm to 500 ppm and pruning up to 3G increases the number of female flowers lowering the number of male flowers resulting in higher yields in both treatments. Though higher productivity was obtained in ethephon @125 ppm and 3G B: C results show profitability in ethephon application @125 ppm than 3G, because pruning is far more laborious, while the right dose at right time for application of ethephon is enough for better performance of cucumber. Therefore, to combat the production of a higher number of male flowers than that female flowers, lower fruit set, and increasing demand for cucumber in Nepal this approach should

be adopted by farmers. The research widens the possibility of recommending the spray of the right dose of ethephon at the right time and pruning intensity as a regular practice for better yield of cucumber, however, further study using more treatments replicated more and repetition of the experiment is recommended for further verification.

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