BIBLIOGRAPHY

ALBIN, CRISTIFINA H. March 2006. Effect Of Different Pinching Techniques On The Growth Yield And Flowering Of Everlasting (*Hellichrysum Bracteatum*), Benguet State University , La Trinidad Benguet.

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ABSTRACT

The study aimed to determine the pinching techniques appropriate in everlasting that would increase flower yield and to compare the effect of pinching on the growth and flowering of everlasting. The study was conducted at the Floriculture Research Area at Benguet State University, La Trinidad Benguet from December 2005 to March 2006.

The findings showed that the number of leaves produced per plant and the number of laterals produced per plant had significantly increased in the pinching applied with more leaves and laterals counted in double pinched and fewer leaves and laterals are produced in unpinched plants. Final height flowering were significantly reduced with more pinching with the shortest plants measures from plants applied with double pinch. The tallest plants were obtained from unpinched plants, and short in double pinched plants and single pinch. Highly significant differences were also observed on the number of days to flower but formation were unpinched plants produced flower bud earlier while double pinch delayed it. Moreover, flower diameter did not significantly affect the different pinching techniques applied on everlasting.

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INTRODUCTION

Background of the Study

One of the most adapted cutflower in higher elevations like Baguio and Benguet is everlasting *(Hellichrysum Bracteatum).* Beckel, Ambiong, Lubas and Alno of La Trinidad; Ambiong and Loakan in Baguio are well known barangays where everlasting are grown. Growers in these areas consider growing everlasting as their main source of income and additional source income for others. They harvest the flowers weekly for two to three months, before the crop reaches its senescence stage. Harvested flowers are being brought to the Baguio City market in the form of leis or in bundles. Most of the buyers are tourists from other places because the flowers serve as a souvenir of the place for them.

Everlasting is one of the best known species of flowering plants which is sometimes called strawflowers. The crop is an upright, warm-weather annual or short lived perennial with daisy-like flower heads in yellow, pink red, and white colors. Everlasting has their, lanced shaped, grayish green leaves up to 5 inches long which are sandpapery in texture, and a hallow, branching stem that may reach 3-4 feet in height. From late spring until fall, strawflower bears flower heads about 2 inches across singly or clusters on the end of the branches.

Hellichrysum species is a native of North Africa and Eastern Australia and is cultivated in some part of Europe. It is propagated by seeds and cuttings through the offsets of older stems. They tolerate sandy and gravelly soils, and they do not need frequent watering but do not thrive well in clayey soils.

The crop is used in annual beds and border planting along fences and backyards. The flowers are used for corsages, leis, garlands, room decorations and for dried floral arrangements. The papery bracts dry beautifully with out losing their color or shape and they last indefinitely. The pompom-like bracts of the double flowered cultivars are specially desirable in arrangements.

Importance of the Study

Apical dominance is an influenced expressed by the terminal bud which suppresses lateral shoot growth on a plant. Pinching the shoot affect the concentration of the auxin in the apical meristems resulting in the growth of dormant lateral buds. Diversified technique of pinching produced multiple branches that can have more flowers.

The result of these study serves as additional knowledge to everlasting growers. It also serves as a guide for them on what kind of pinching technique appropriate for everlasting to have more number of lateral shoots and a quality of flowers.

Objectives of the Study

The study were conducted to determine the pinching technique appropriate in everlasting that would increase cutflower yield and compare the effect of pinching on the growth and flowering of everlasting.

Place and Time of the Study

The were conducted on the Ornamental Research Area, Benguet State University, La Trinidad, Benguet from December to March 2006.

REVIEW OF RELATED LITERATURE

Pinching is a diversified method which affects the concentration of auxin in the apical meristems resulting to the growth of dormant lateral buds (Bonner et. al.1959).

According to Larson (1980), pinching is a cultural practices which is highly related to pruning, however, the main objective of pruning is different from those of pinching. Pruning is done to reduce the height of the plant, to prevent the spread of disease and insets pest to other parts of the plant and to encourage the growth of larger cane or stem for the production of longer stemmed blooms. Pinching on the other hand is employed to build up the plants before the are allowed to flower, to produced the desired number of lateral stems or branches and to coincide harvest periods which peak demands and high prices. Their are basically two types of pinches- soft and hard. Soft pinch is done when the flower bud is smaller than a pea and hard pinch is applied if the flower buds is bigger than a pea seed.

Hermano (2000) says that two months from planting, seed sowing to planting, the plants are pinched. Pinching is done just above the sixth node from the base of the plants. If the market demands lesser volume with continuous supply, pinch the half of the flower and allow the other half to flower. This practice is called " pinched and a half and double pinched" things that are done when the resulting shorts are pinched. Lateral shoots produces unnecessary shoots from the previous cut or pinch. Failure to remove them would result in shoot stem and smaller flower.

As young shoots develop, some may need to be pinched out to encourage the plant to produce side shoot and to develop a bushy habit (Bleasdale, 1970). Pinching is done by nipping the growing tip of a young plant if a uniform growing habbit is required,

pinched tall plants at five to six joints by removing the tip of each along shoot back to the required height. (Brickell, 1993). Mc Daniel (1982) added that pinching plants by removing ¼ to ¾ inches of the terminal shoots of each cutting with finger produce several lateral branches.

Larson (1980) further defined that pinch means only the original terminal stem is pinched. The resulting four to five vegetative shoots will elongate and flower at the same time from planting. The plants will essentially be out of flower production until the second flower crops develop. Pinched and a half means a single pinch of the main stem and later when resulting shoots are long enough about ½ of the largest shoots on each plants are pinched. The half pinched actually is 2 to 3 pinches per plant of the later pinching time and double pinch means a single pinch of the main stem, plus a later pinch of all the resulting shoots when they are long enough.

In 1950, Laurie and Ries as cited by Zambrano (1980) found that better flower of longer stem of extra quality are obtained from pinched plants. They also added that when a Christmas harvest is desired, the plants should be pinched from October 17 to 21 or from October 21 to 23. Counting ahead from a specific day is necessary in order that a grower can harvest and bring this cut flower in the market in a desired time.

Pinching at proper height result in stronger stalks which promote continuity of flower production. Pinching keeps the plant in a vigorous condition. It improves the quality and promotes a well balanced appearance. Lack of pinching result in a struggly bush with small and poorly formed flowers (Rockwell, 1959). Fuller (1961) stated that the pinching induces flowering and increase the number of branches on the stem. Awingan (2001) added that pinching significantly reduces flower size to almost half

compared to unpinced plants. Pinching prevents the limited carbohydrates supply from being expanded in the early stage of growth, thereby promoting the development of bottom breaks.

Rimando and Lazaro (1976) employed pinching on different cultivars of roses and they discovered that the cultivars, light, and water supply influenced the time required for a flower bud to develop from pinching to harvest. Pinching shoots as they are produced prevents the maturity flower and increased carbohydrates concentration which stimulates botton breaks and results in well-balanced appearance and elegant blooms (Baily, 1930).

In Inchan (2001) study on the effect of pinching technique on the growth and flowering of carnation, the result showed that the number of pinching applied with more leaves and laterals in unpinced plants. Final plant height, cut flower stem length and flower size were likewise significantly reduced with more pinching and smallest blooms we measured from plants with double pinched. The tallest plants with the longest stem and biggest flower were obtained from unpinched plants and those that are applied with single pinch. However more flowers were produced by plants applied with double pinch and less in unpinched and those applied with single pinch.

Zambrano (1980) studied on the effect of pinching roses under Benguet condition, the result were analyzed on the bases of flower quality, yield cane production and percentage of blind shoots. Hard pinch roses gives the most satisfactory result, had longer stem and more elegant blooms. While soft pinch rose develop more bottom and lateral bud breaks. Unpinched plants were out yielded and outgrown by the soft and hard pinched plants. Greater percentage of blind shoots was also observed on unpinched

lateral shoots. Larger and longer stemmed cut flowers were obtained from hard pinched pants. The smallest were taken from the control.

MATERIALS AND METHOD

Materials

The materials used in the experimental are everlasting seedlings, garden tools organic and inorganic fertilizers, watering cans, hose, and measuring and labeling materials.

Method

Experimental design and treatment. The study was conducted under filed conditions and was laid out in a randomized complete block design with 3 replications.

The different treatments were as follows:

Code	Description
T_1	Unpinched
T_2	Single pinch- only the original terminal stem is pinched from the sixth node one month from transplanting
T_3	Double pinch- A single from the main stem is done plus a later pinch of all the resulting shoots when they are long enough to be pinched to the sixth node.

Raising the seedlings. The seeds of everlasting were sown in an outdoor seedbed before they are transplanted in the filed after 3 to 4 weeks from sowing. Regular irrigation, pest management and other recommended cultural practices were applied for optimum growth of the crop.

Land Preparation and fertilizer application. An area of 135 square meters were thoroughly prepared ad divided into plots measuring 1mx5m. The experimental plots were dug, leveled and applied with fully decomposed chicken manure at a rate of 3 tons per ha and were mixed thoroughly with the soil.

Transplanting. The plots were irrigated first before the four week old seedling were transplanted the planting distance used is 20 cm x 20 cm between hills and rows. Any dead seedlings were immediately replaced are week after established about 4 weeks from transplanting. The top of the stem were pinched of by hands just above the sixth node.

Care and Management. Other cultural practices such as control, weeding and irrigation were doe uniformly to ensure optimum growth and development of the experiment plants.

Data Gathering

A. Vegetative Growth

1. Number of leaves per plant at flowering. The number of leaves per plants at flowering stage when the first flower show 1cm in diameter were counted.

2. Final Height at flowering at 50% anthesis (cm). These were done by measuring the height of the plant from the base up to the tip of flowers at flowering.

3. Number of laterals produced per plant. The number of laterals produced plant were counted.

B. Reproductive Growth

1. Days from transplanting to flower bud formation (0.5 cm flower bud size). The number of days from transplanting to 0.5 cm flower bid size was counted.

2. Number of days from flower formation to 50% anthesis. The number of days from bud formation (0.05 cm bud size) to 50% anthesis of the first flower were counted and recorded.

C. Yield

1. Number of flower bud per plant. The numbers of buds per plants for the cropping duration were counted.

2. Number of flower bud produced per 1x5m plot. This was taken by counting the number of flower buds produced per 1x5m plot for the cropping duration.

D. Flower quality

1. Flower diameter. The diameter of the flower at 50% anthesis was measured in cm.

E. Meteorological Data

Meteorological data were gathered during the entire cropping period with the following data taken at the BSU-PAG-ASA station.

1. Rainfall (mm)
2. Relative and Maximum temperature
3. Minimize and Maximum temperature

F. Documentation of the study in Pictures

RESULTS AND DESCUSSION

Number of Leaves at Flowering

Table 1 shows that highly significant differences were obtained on the average number of leaves produced per plant in everlasting as affected by the different pinching techniques applied. The highest leaf count per plant was obtained from double pinched plants with a mean of 281.28 leaves per plants at flowering. Unpinched plants produced the lowest number of leaves per plant a mean of 40. 95 leaves followed by the single pinch with a mean of 106 leaves. This result shows that the number of pinches applied in everlasting plants led to the increase in the number of leaves formed on the additional lateral.

Table 1. Number of leaves per plants at flowering

TREATMENT	MEAN
Unpinched	40.95[c]
Single pinch	106.00[b]
Double pinch	281. 28[a]

Means with common letter are not significantly different at 5% level DMRT

Final Height at Flowering

The different pinching techniques applied had significantly affect the final height of everlasting at flowering (Table 2).The tallest plants were measured from the control or unpinched plants with a mean of 23.39 cm at flowering. Plants applied with single pinch were shorter with a mean of 112.58 cm while the shortest plants measured from those of double pinch.

Table 2. Final height per plants at 50% Anthesis (cm)

TREATMENT	MEAN
Unpinched	123.39[a]
Single pinch	122.58[b]
Double pinch	90.14[c]

Means with common letter are not significant different at 5% level by D.M.R.T

Number of Laterals Produced per plants at 50% Anthesis.

The different pinching technique used has highly significant effect on the number of laterals produced per plant at flowering of everlasting (Table 3). Unpinched plants produced the lowest number of laterals with a mean of 8.05 at flowering followed by single inch with a mean of 18. 55 laterals. Double pinch promoted the production of the highest number of laterals with the mean of 25.28 at flowering.

Table 3. Number of Days from transplanting to flower bud formation

TREATMENT	MEAN
Unpinched	8.05[c]
Single pinch	18.55[b]
Double pinch	25.28[a]

Means with common letters are not significantly different at 5% level by DMRT

Days From Transplanting to Flower Bud Formation

As presented in table 3, significant differences were obtained on the number or days from transplanting to flower-bud formation. The unpinched plants flowered earlier with an average of 47.50 days followed by single pinch which flowered after 59.84 days.

Plants applied with double pinch are the latest form flower buds at 0.5 bud size at a mean of 75.00 days from transplanting.

Table 4. Number of days from transplanting to flower bud formation.

TREATMENT	MEAN
Unpinched	47.50[c]
Single pinch	59.84[b]
Double pinch	75.00[a]

Means with common letter are not significantly different at 5% level of MRT

Number of Days from flower Bud Formation to 50% Anthesis.

Result showed that significant differences in the number of days from flower bud formation to 50% anthesis as affected by different pinching techniques applied (Table 5). Unpinched plants significantly delayed flowering at reaching 50% anthesis after 22-23 days. The earliest to reach 50 % anthesis were the double pinched plants with 50% blooms after days followed by single pinch with a mean of 21 days from 2.5 cm bud size.

Table 5 Number of days from flower bud formation to 50% Anthesis

TREATMENT	MEAN
Unpinched	22.33[a]
Single pinch	21.00[b]
Double pinch	20.39[c]

Means with the same letter are not significantly different at 5% level of DMRT.

Number of flower buds per plant.

Highly significant differences were obtained from everlasting plants as affected by different pinching techniques applied (Table 6). Unpinched plants produced significantly lower number of flowers with an average of 20.39 flowers per plants. Fewer flowers were also counted in plants with single pinch which had the mean of 32.50 flowers. Plants applied with double pinch produced more flowers per plants counted at a mean of 49.00 flowers.

Table 6. Number of days from flower bud formation to 50% Anthesis

TREATMENT	MEAN
Unpinched	22.23[a]
Single pinch	21.00[b]
Double pinch	20.39[c]

Means with a common letter are not significantly different at 5% level by DMRT.

Number of Flower Buds per 1x 5 cm Plot

The effect of the different pinching techniques on the flower yield per plot is shown in Table 8. Statistical analysis shows that different pinching techniques applied with double pinch significantly increase in the number of flowers produced per plot with a mean of 1398.33 flowers. The unpinched plants had the lowest flowers produced with the mean of 595.667 flowers per plant.

Table 7. Number of flower bud produced for 1x5 m lot

TREATMENT	MEAN
Unpinched	595.67[c]
Single pinch	983.00[b]
Double pinch	1398.39[a]

Mean with common letter are not significantly different at 5% level DMTRT

Flower Diameter

Table 8 shows that there were no significant differences obtained on the flower diameter of everlasting flower as affected by different pinching techniques applied. Flowers diameter measured range fro 4.18 and 5.81 cm.

Table 8 Flower diameter (cm)

TREATMENT	MEAN
Unpinched	5.81[a]
Single pinch	5.14[a]
Double pinch	4.18[a]

Means with a common letter are not significantly different at 5% level by DMRT.

SUMMARY, CONCLUSION AND RECOMMENDATION

Summary

The study was conducted to determine the pinching techniques appropriate in everlasting that would increase flower yield and to determine compare the effect of pinching techniques on the growth and flowering of everlasting. The study was conducted at Benguet State University, Floriculture Project Research Area from December 2005 to March 2006.

The result showed that the number of leaves produced per plant and the number of laterals produced per plants significantly increased with increase in the number of pinching applied with leaves and laterals counted in double pinch and fewer leaves and laterals are produced in unpinched plants. Final height at flowering were likewise significantly reduced with more pinching with the plants were measured fro plants applied with double pinch. The tallest plants were obtained from unpinched plants and those that were applied with single pinch. Highly significant differences were also obtained on the number of days from transplanting to flower bud formation ad flower bud formation to 50% anthesis. However more flowers were produced by the plants with double pinch and less in the unpinched and those with single pinch only. Moreover flower diameter did not significantly affect the different pinching applied on everlasting.

Conclusion

Based on the finding techniques to be applied is based on the purpose of the grower. If the grower wishes to more flowers, double pinch is applied and the grower's wishes to produced taller plants unpinched and single pinched.

Recommendation

If the wishes to produce taller plants and single pinch is recommended to be applied 4-6 weeks after transplanting by snapping-off the shoot above the sixth node. If the grower wishes to produce more flowers and higher number of laterals per plants, double pinch techniques are recommended.

APPENDICES

Appendix Table 1. Number of leaves produce per plant at flowering

TREATMENT	REPLICATION I	II	III	TOTAL	MEAN
Unpinched	42.17	40.50	40.67	122.84	40.94
Single Pinched	98.67	113.33	106.00	318.00	106.00
Double Pinched	292.50	262.50	288.84	843.83	281.28
TOTAL				1284.67	
MEAN					428.22

ANALYSIS OF VARIANCE TABLE

Source of Variation	Degree of Freedom	Sum of Squares	Mean Squares	Computed F Value	Tabulated F 0.05	0 .01
Replication	2	77.575	38.787			
Factor A	2	92712.352	46356.176	326.94**	6.94	18.00
Error	4	567.931	141.983			
TOTAL	8	93357. 858				

** =highly significant Coefficient of Variation: 8.358%

Appendix Table 2 Final height of flowering at 50% anthesis (cm)

TREATMENT	REPLICATION I	II	III	TOTAL	MEAN
Unpinched	124.17	126.33	119.67	370.170	123.390
Single Pinched	108.00	113.50	116.33	337.703	112.577
Double Pinched	87.17	89.83	93.33	270.430	90.143
TOTAL				978.303	
MEAN					108.70

ANALYSIS OF VARIANCE TABLE

Source of Variation	Degree of Freedom	Sum of Squares	Mean Squares	Computed F Value	Tabulated F 0.05	0 .01
Replication	2	22.963	11.482			
Factor A	2	1725.523	862.762	63.54**	6.94	18.00
Error	4	54.314	13.578			
Total	8	1802.800				

** =highly significant Coefficient of Variation: 3.39%

Appendix Table 3. Number of laterals per plant

TREATMENT	REPLICATION I	II	III	TOTAL	MEAN
Unpinched	6.83	8.83	8.50	24.16	8.05
Single Pinched	17.5	19.33	18.83	55.66	18.5
Double Pinched	23.67	24.17	28	75.84	75.84
TOTAL				155.66	
MEAN					34.13

ANALYSIS OF VARIANCE TABLE

Source of Variation	Degree of Freedom	Sum of Squares	Mean Squares	Computed F Value	Tabulated F 0.05	0 .01
Replication	2	9.053	4.527			
Factor A	2	452.256	226.628	144.54**	60.94	18.00
Error	4	6.258	1.565			
TOTAL	8	467.567				

** =highly significant Coefficient of Variation: 7.23%

Appendix Table 4. Days from transplanting to flower bud formation

TREATMENT	REPLICATION I	II	III	TOTAL	MEAN
Unpinched	48.00	47.17	47.33	142.50	47. 50
Single Pinched	62.17	57.67	59.67	179. 51	59.88
Double Pinched	75.00	74.83	75.17	225.00	75.00
TOTAL				547.01	
MEAN					60.79

ANALYSIS OF VARIANCE TABLE

Source of Variation	Degree of Freedom	Sum of Squares	Mean Squares	Computed F Value	Tabulated F 0.05	0 .01
Replication	2	5.056	2.528			
Factor A	2	1138.370	569.185	409.73**	6.94	18.00
Error	4	5.557	1.389			
TOTAL	8	1148.982				

** =highly significant Coefficient of Variation: 1.94 %

Appendix Table 5. Number of days fro flower formation to 50% anthesis

TREATMENT	REPLICATION I	II	III	TOTAL	MEAN
Unpinched	21.83	22.5	22.67	67.00	21.33
Single Pinched	20.67	21.33	21.00	63.00	21.00
Double Pinched	20.17	20.67	20.33	61.17	20.39
TOTAL				191.17	
MEAN					21.241

ANALYSIS OF VARIANCE TABLE

Source of Variation	Degree of Freedom	Sum of Squares	Mean Squares	Computed F Value	Tabulated F 0.05	0 .01
Replication	2	0.596	0.298			
Factor A	2	5.926	2.963	81.05**	6.94	18.00
Error	4	0.146	0.037			
TOTAL	8	6.669				

** = highly significant Coefficient of Variation: 0.90 %

Table 6. Number of flower buds produced per plants

TREATMENT	REPLICATION I	II	III	TOTAL	MEAN
Unpinched	16.33	24.83	20.00	61.160	20.387
Single Pinched	32.67	31.33	33.50	97.500	32.500
Double Pinched	49.33	47.00	50.67	147.00	49.00
TOTAL				305.66	
MEAN					33.963

ANALYSIS OF VARIANCE TABLE

Source of Variation	Degree of Freedom	Sum of Squares	Mean Squares	Computed F Value	Tabulated F 0.05	0 .01
Replication	2	6.495	3.247			
Factor A	2	1237.706	618.853	63.23**	6.94	18.00
Error	4	39.150	9.787			
TOTAL	8	1283.315				

** = highly significant Coefficient of Variation: 9.21 %

Table 7. Number of flower buds produced per 1x5 m plot

TREATMENT	REPLICATION I	II	III	TOTAL	MEAN
Unpinched	509	665	613	1787	595.657
Single Pinched	987	997	965	2949	983.000
Double Pinched	1369	1353	1473	4195	1398.333
TOTAL				8931	
MEAN					992.33

ANALYSIS OF VARIANCE TABLE

Source of Variation	Degree of Freedom	Sum of Squares	Mean Squares	Computed F Value	Tabulated F 0.05	0 .01
Replication	2	6488.000	3244.000			
Factor A	2	966802.667	483401.333	127.57**	6.94	18.00
Error	4	15157.333	3789.333			
TOTAL	8	988488.000				

** = highly significant Coefficient of Variation: 6.20%

Table 8. Flower Diameter (cm)

TREATMENT	REPLICATION I	II	III	TOTAL	MEAN
Unpinched	5.25	6.92	5.25	17.420	5.807
Single Pinched	5.03	4.97	5.42	15.420	5.140
Double Pinched	4.13	4017	4.25	12.550	4.183
TOTAL				45.39	
MEAN					15.13

ANALYSIS OF VARIANCE TABLE

Source of Variation	Degree of Freedom	Sum of Squares	Mean Squares	Computed F Value	Tabulated F 0.05	0 .01
Replication	2	0.476	0.238			
Factor A	2	3.995	1.997	5.29^{ns}	6.94	18.00
Error	4	1.510	0.378			
TOTAL	8	5.981				

ns = not significant Coefficient of Variation: 12.18%