BIBLIOGRAPHY

BADIVAL, JELYN S. OCTOBER 2008. Effect of Osmocote 15-9-12 on the Growth, Flowering and Yield of Anthurium cv. Kansako. Benguet State University, La Trinidad, Benguet.

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ABSTRACT

The study was conducted at the Benguet State University Ornamental Horticulture Research Area from December, 2007 to April, 2008 to evaluate the effects of osmocote 15-9-12 controlled release fertilizer on the vegetative, reproductive growth, yield of anthurium; to compare the effects of osmocote 15-9-12 with the recommended practice of fertilizer application in relation to the growth, flowering and yield of anthurium; and to determine the economics of applying osmocote 15-9-12 in anthurium cutflower production.

Results revealed that vegetative growth was significantly enhanced with the application of osmocote 15-9-12 + recommended rate of 1 tbsp 14-14-14 + 1 tbsp 45-0-0/ 5 gal water applied 1 cup/ plant/ week which produced taller plants with longer stems that were thicker and produced more leaves. Earlier flowering was noted in treatments applied with osmocote 15-9-12 at a higher rate of 15g/ pot + recommended rate. This treatment also promoted the production of highest yield and highest ROI compared to plants applied with the lower rates of osmocote 15-9-12 at 5g/ pot and 10g/ pot either applied alone or in combination with the recommended rate.

Based on the above findings, osmocote 15-9-12 + the recommended rate is recommended for anthurium cutflower production to improve the vegetative growth, enhanced flowering and for the production of higher volume of cutflowers and highest ROI which lead to increased farm income.

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INTRODUCTION

Nature of the Study

Osmocote is composed of granules of dry plant nutrients, which had been encapsulated within multiple layers of polymeric resin. Water vapor penetrates the permeable shell and dissolves the nutrient care. The resulting osmotic pressure within the granule meters the liquid nutrients through the coating and into the surrounding soil/media. The granule increase in size and an osmotic pressure is formed. The dissolved nutrients gradually diffuse through the membrane coating into the soil. This process continues until all nutrients in the granules had been dissolved; in this way; continues supply of daily portion of the plant nutrients is available for plant use.

Osmocote 15-9-12 has total nitrogen composed of 7% ammoniacal nitrogen and 8% nitrate nitrogen to make it 15% nitrogen. Product longevity is 5-6 months under 70 F average media temperature. This product is suitable for perennial flowering plants such as anthuriums and is excellent for hanging plant basket.

Controlled release fertilizers like Osmocote 15-9-12 has several advantages: (1) they are safe and reliable, such that there is no burning effects when used in the recommended rate; (2) provide uniform and well balanced crop development since they provide daily nutrient for the crop: (3) there is continues supply of nutrients: (4) there is minimal leaching of nutrients: (5) nutrients are made available to targeted plants and not the weeds: (6) easy to apply and application is once 3-4 months up to 9-10 months period depending on the product formulation; and (7) saves on labor, transport and storage. Controlled release fertilizers has been proven effective in several crops based on studies conducted.

Anthurium is an exotic tropical cutflower crop that can be grown anywhere in the country in areas with an average night temperature of 18^{o}C and day temperature of 28^{o} C. It is a shade plant and grows favorably in 60 to 70% light level. Since the root system of this crop is fleshly, application of fertilizer is in liquid form to prevent injury to the plant. Weekly application of 1 tbsp urea + quick release 14-14-14 fertilizer is usually done for improved growth and cutflower yield.

Objectives of the study

The study was conducted to:

1. To evaluate the effects of osmocote 15-9-12 controlled release fertilizer on the vegetative growth, reproductive growth and yield of anthurium.
2. To compare the effects of osmocote 15-9-12 with the recommended practice of fertilizer application in relation to the growth, flowering and yield of anthurium.
3. To determine the economics of applying osmocote 15-9-12 in anthurium cutflower production.

Place and time of study

The study was conducted at the Ornamental Horticulture Research Area, Benguet State University, La Trinidad, Benguet from December, 2007 to April 2008.

REVIEW OF LITERATURE

The Plant

Anthurium belongs to the family Aracea and originated from South America. The color ranges from white, pink, orange, coral, obake to red of different shades. Anthuriums are very attractive exotic cutflowers most especially the spathe, which is a modified leaf and varies in color, size, shape, and the prominence of veins.

There are two types of anthurium species under cultivation: the foliage and the flowering type. The foliage type has very inconspicuous and decidedly unattractive flowers and is grown from their handsome and velvety leaves. Anthuriums are not endemic here in the Philippines and all cultivars of *Anthurium andreanum* Linn. Grown locally are inductions from other countries. Other types of anthuriums grown by enthusiasts include the obake types, which extremely vary in sizes, and shapes of the spathe. Some obake types are all green. Others have white and green combinations or red pink or orange and green spathe.

Growing Medium

Anthuriums grow best in a well-aerated medium with high organic matter content. It should have good water retention capacity and at the same time produce enough drainage. It must be able to anchor the roots and stem firmly so that the plant will be dislodged or easily recline as it grows or when it is subjected to strong winds and rain (Rosario, 1991).

Effect of Fertilizer on Plant Growth

Fertilizer is one of the most important ingredients of the total recipe to grow plants. Plants do need water, air, light, nutrition, soil and temperature all in right ratio at the right moment and all right period (Scotts, 1996).

Rosario stated that both organic and inorganic fertilizers are used by our local anthurium growers. The amount depends on the medium used, light conditions and cultivar.

Complete fertilizers carry nutrient elements such as nitrogen, phosphorus and potassium which plants need for optimum growth and development (Gardner, 1949).

Buyao (1994) reported that basal application of $N\text{-}P_2O_5\text{-}K_2O$ was needed in promoting the growth of leaves and stem of plants.

Effect of Slow Release Fertilizer

French and Alsburg (1989) stated that the major advantage of slow release fertilizer is that a single application can provide the majority of the nutrients for the growing season. Following the necessary method of application, production of superior quality plants can be obtained.

Slow release fertilizers are widely used in foliage industries since they supply adequate amounts of nutrient for extended periods of time (3-12 months) especially on slow growing plants. Slow release fertilizer releases nutrients slowly but a portion is available immediately therefore, good quality plants can be obtained when properly applied. However, it causes damage when excess amount is applied (Joiner, 1982).

Darwin (2004) stated that application of osmocote 15-9-12 enhanced earlier number of days from flower bud formation to harvesting at 50% anthesis on aster. He recommended slow release fertilizer at the rate of 80g/m^2 osmocote should be applied to improve the vegetative and reproductive growth and increase cutflower yield of the three aster varieties grown.

Lacay (2004) recommended 40 g osmocote plus + 800 g chicken manure and stated that it is the best fertilizer treatment for rose cutflower production due to lesser labor in fertilizer application and lower cost of production giving a ROI of 70%.

Slow release fertilizer at the rate of 30 g/pot osmocote 14-14-14 should be applied to improve the vegetative and reproductive growth of the African violets cvs. Ginger and Lady Pink grown in 1:1:1 alnus leaves compost, compost rice hull and garden soil is recommended (Estong.2005).

MATERIALS AND METHODS

Materials

The materials used were established three year old flowering anthurium plants cv. Kansako, growing media, pesticides, Osmocote 15-9-12 controlled release fertilizer, 14-14-14, urea, black plastic net house, labels, weighing scale, farm tools.

Methods

The study was arranged in RCBD experimental design with three replications per treatment.

All recommended production management operation practices like weeding, crop protection sprays, irrigation and growing media was applied uniformly to all crops to ensure good growth of the plants and production of quality cutflowers.

The treatments were as follows:

T_1- no fertilizer (control)

T_2- Osmocote 15-9-12 at 5g/ pot

T_3- Osmocote 15-9-12 at 10 g/ pot

T_4- Osmocote 15-9-12 at 15 g/ pot

T_5- 1 tbsp 14-14-14 + 1 tbsp 45-0-0/5 gal water applied 1 cup/plant/week (Recommended rate)

T_6-1tbsp 14-14-14 +1 tbsp 45-0-0/5 gal water applied 1 cup/plant/week + Osmocote 15-9-12 at 5 g/ pot

T_7-1 tbsp 14-14-14 + 1 tbsp 45-0-0/ 5 gal water applied 1 cup/ plant/ week + Osmocote 15-9-12 at 10 g/ pot

T_8-1 tbsp 14-14-14 + 1 tbsp45-0-0/ 5 gal water applied 1 cup/plant/week + Osmocote 15-9-12 at 15 g/ pot

Data Gathered

A. Vegetative growth

1. Initial height. This was measured in cm after application of slow-release fertilizers.

2. Final height at harvesting stage (3/4 maturity) in cm. The plant height was measured at harvesting stage.

3. Initial number of leaves per plant. This was counted after application of slow-release fertilizers.

4. Number of leaves per plant at flowering. The number of leaves pre plant was counted at flowering stage.

5. Initial stem thickness. This was measured in cm after application of slow- release fertilizers.

6. Stem thickness at flowering (cm). This was obtained by measuring the diameter of stem at ¾ maturity of flowers.

B. Reproductive growth

1. Number of days from harvesting of the first flower to flower bud formation of the second flower (1 cm bud size). The number of days from harvesting of the first flower to flower bud formation of the second flower was recorded.

2. Number of days from visible flower bud formation to harvesting stage (3/4 maturity). The number of days from flower bud formation to harvesting stage was recorded.

C. Cutflower Yield

1. Volume of cutflowers harvested per plant for 4 months duration will be recorded.

2. Volume of cutflowers harvested per treatment for 4 months duration was recorded.

D. Cutflower Quality

1. Flower size. The length and width of spathes of harvested flowers was measured in cm.

2. Cutflower stem length at harvest (cm). The length of the stem from the base of the plant to the flower tip was measured.

E. Cost and Return Analysis. All inputs that were used in the study were recorded and the return on investment was computed using the formula:

$$ROI\ (\%) = \frac{\text{Gross sale} - \text{Total expenses}}{\text{Total expenses}} \times 100$$

G. Documentation of study through pictures.

RESULTS AND DISCUSSION

Initial Height

Table 1 shows highly significant differences were noted on the initial height of the anthurium plants measured after the application of Osmocote 15-9-12.

Final Height at Harvesting Stage (3/4 maturity)

Highly significant differences were likewise obtained on the final height of anthurium plants at flowering as affected by the different fertilizer treatments. As shown on Table 1, plants applied with 15g osmocote 15-9-12/ pot + the recommended rate of 1 tbsp 14-14-14 + 1 tbsp 45-0-0/ 5 gal water at 1 cup/ plant/ week were the tallest with a mean of 96.33 cm. However, it was comparable statistically with plants applied with osmocote 15-9-12 at 10g/ pot + 1 tbsp 14-14-14 + 1 tbsp 45-0-0/ 5 gal water at 1 cup/ plant/ week showing a mean of 85.67 cm at flowering; while the control were the shortest with a mean of 57.33 cm.

The above results confirm with the earliest statement of Martin and Leonard (1970) that plants grown with sufficient amounts of nitrogen in the soil makes the plant thrifty and rapid in growth.

Day-a (1999) found that application of 75-75-75 or 100-100-100 kg NPK/ ha improves plant height, increase number of leaves, affects the production of longer flower stems, bigger blossoms and higher number of suckers per plant and increase yield of cutflower in Benguet Lily.

Table 1. Initial height and final height at harvesting stage (cm)

TREATMENTS	INITIAL HEIGHT MEAN (cm)	FINAL HEIGHT MEAN (cm)
0-0-0 (control)	54.00c	57.33c
Osmocote 15-9-12 at 5g/ pot	54.33c	59.00c
Osmocote 15-9-12 at 10g/ pot	71.67b	77.00b
Osmocote 15-9-12 at 15g/ pot	71.00b	77.67b
1 tbsp 14-14-14 + 1 tbsp 45-0-0/ 5 gal water/ 1 cup/ plant/ week (Recommended Rate)	67.33b	73.33b
Recommended rate + 5g osmocote 15-9-12/ pot	69.67b	75.00b
Recommended rate + 10g osmocote 15-9-12/ pot	79.67b	85.67ab
Recommended rate + 15g osmocote 15-9-12/ pot	92.00a	96.33a

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

Gardner (1949) stated that complete fertilizers carry nitrogen, phosphorus and potassium which plants need for optimum growth and development.

Initial Number of Leaves per Plant

Initial number of leaves were significantly differences as shown in Table 2.

Number of Leaves per Plant at Flowering

The number of leaves at flowering is presented in Table 2. Result showed significant differences on the number of leaves at flowering due to the fertilizer applied.

Osmocote 15-9-12 at 15g/ pot + the recommended rate produce more leaves per plant at flowering stage with a mean of 6.33 leaves per plant while the control produces only 3.33 leaves. Leaf count among the fertilized plants varies from 4.33 to 6.00 leaves per plant four months after fertilizer application.

This result complements the claims of Mendiola (1976) that nitrogen, when applied to plants at certain period of their growth cease to produce new branches and leaves or to increase those already formed.

Table 2. Initial number of leaves per plant and number of leaves per plant at flowering

TREATMENTS	INITIAL LEAVES MEAN	FINAL LEAVES MEAN
0-0-0 (control)	3.33c	3.33c
Osmocote 15-9-12 at 5g/ pot	4.00bc	4.33bc
Osmocote 15-9-12 at 10g/ pot	3.67bc	4.67abc
Osmocote 15-9-12 at 15g/ pot	5.67a	5.67ab
1 tbsp 14-14-14 + 1 tbsp 45-0-0/ 5 gal water/ 1 cup/plant/week (Recommended rate)	4.67abc	5.67ab
Recommended rate + 5g osmocote 15-9-12/ pot	4.33abc	5.67ab
Recommended rate + 10g osmocote 15-9-12/ pot	4.33abc	6.00ab
Recommended rate + 15g osmocote 15-9-12/ pot	5.00ab	6.33a

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

Initial stem thickness (cm)

Table 3 shows that there was significantly difference on the initial stem thickness of the anthurium plants measured after the application of slow release fertilizer.

Table 3. Initial stem thickness and final stem thickness at flowering (cm)

TREATMENTS	INITIAL STEM THICKNESS MEAN (cm)	FINAL STEM THICKNESS MEAN (cm)
0-0-0 (control)	1.10b	1.13c
Osmocote 15-9-12 at 5g/ pot	1.11b	1.29bc
Osmocote 15-9-12 at 10g/ pot	1.57a	1.63ab
Osmocote 15-9-12 at 15g/ pot	1.63a	1.69ab
1 tbsp 14-14-14 + 1 tbsp 45-0-0/ 5 gal water/ 1 cup/ plant/ week (Recommended rate)	1.60a	1.63ab
Recommended rate + 5g osmocote 15-9-12/ pot	1.62a	1.67ab
Recommended rate + 10g osmocote 15-9-12/ pot	1.76a	1.85a
Recommended rate + 15g osmocote 15-9-12/ pot	1.95a	2.05a

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

Stem Thickness at Flowering (cm)

The effect of the fertilizer applied with regards to the stem thickness at flowering is shown in Table 3. Application of 15g osmocote 15-9-12/ pot + the recommended rate produced significantly the thickest stem at flowering which had a mean of 2.05 cm. This was followed by the plants applied with 10g osmocote 15-9-12/ pot + the recommended rate with a mean of 1.85 cm. Thinnest stem was measured from the control with a mean of 1.13 cm at flowering.

Number of Days from Harvesting of the
First Flower to Flower Bud Formation
of the Second Flower

Results obtained were significantly different with regards to the number of days from last harvesting to the formation to the next flower based on 1 cm bud size as shown in Table 4. It was noted that the recommended rate + 15g osmocote 15-9-12/ pot was the earliest to initiate flower buds after the last harvest. This was followed by 15g osmocote 15-9-12/ pot with a mean of 10.86 days.

Furthermore, it was noted that control were late flowering at 22.67 days from last harvest. On the other hand, it is statistically comparable to all other treatments with means ranging from 12.68 to 17.03 days.

Bautista et.al (1989) stated that each plant or variety has different genetic make-up that affects the earliness and regularity of flowering.

Mendiola (1958) stated that nitrogen promotes the growth of sexual buds and flowers.

Table 4. Number of days from harvesting of the first flower to flower bud formation of the second flower

TREATMENTS	MEAN (days)
0-0-0 (control)	22.67a
Osmocote 15-9-12 at 5g/ pot	14.61ab
Osmocote 15-9-12 at 10g/ pot	14.25ab
Osmocote 15-9-12 at 15g/ pot	10.86b
1 tbsp 14-14-14 + 1 tbsp 45-0-0/ 5 gal water/ 1 cup/ plant/ week (Recommended rate)	15.89ab
Recommended rate + 5g osmocote 15-9-12/ pot	12.68ab
Recommended rate + 10g osmocote 15-9-12/ pot	17.03ab
Recommended rate + 15g osmocote 15-9-12/ pot	9.56b

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

Number of Days from Visible Flower Bud Formation to Harvesting Stage

Significant differences were observed on the number of days from visible flower bud formation to harvesting stage as shown in Table 5. Osmocote 15-9-12 at 15g/ pot were the earliest to form flower bud and mature with a mean of 58.67 days. However, it is comparable to plants applied with 10g osmocote/ pot + the recommended rate and recommended rate of 1 tbsp 14-14-14 + 1 tbsp 45-0-0/ 5 gal water/ 1 cup/ plant/ week having a mean of 63.00 days and 64.67 days, respectively. The control was the latest to form flower bud and mature with a mean of 89.33 days.

Bautista et.al (1983) mentioned that each variety/ plant contains a set of genetic make-up which determines earliness of bearing and maturity.

Hartman and Kester (1975) reported that during the juvenile phase, the mature plants begin flowering by responding to various flower induction stimuli. These may be environmental signals, such as photoperiod (either long or short days) or temperature regimes (cool or warm).

Darwin (2004) stated that application of osmocote 15-9-12 enhanced earlier number of days from flower bud formation to harvesting stage at 50% anthesis on aster.

Table 5. Number of days from visible flower bud to harvesting stage (3/4) maturity)

TREATMENTS	MEAN (days)
0-0-0 (control)	89.33a
Osmocote 15-9-12 at 5g/ pot	86.67a
Osmocote 15-9-12 at 10g/ pot	79.67b
Osmocote 15-9-12 at 15g/ pot	69.33cd
1 tbsp 14-14-14 + 1 tbsp 45-0-0/ 5 gal water/ 1 cup/ plant/ week (Recommended rate)	64.67de
Recommended rate + 5g osmocote 15-9-12/ pot	73.67bc
Recommended rate + 10g osmocote 15-9-12/ pot	63.00de
Recommended rate + 15g osmocote 15-9-12/ pot	58.67e

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

Length of Spathe

Length of spathe is presented in Table 6. Statistical analysis showed significantly differences on the length of spathe as affected by fertilizer application. 15g osmocote 15-9-12/ pot + the recommended rate had the longest spathe but it is comparable to all fertilized plants having a mean of 13.53 to 15.53 cm, showing slight differences only. The control were the shortest having a mean of 10.17 cm.

Results reveal that flower size was likewise affected by the rates of osmocote 15-9-12 applied alone or in combination with the recommended rate. These findings show the direct influence of plant nutrition on both vegetative and reproductive growth of plants.

Table 6. Length of spathe (cm)

TREATMENTS	MEAN (cm)
0-0-0 (control)	10.17b
Osmocote 15-9-12 at 5g/ pot	13.33a
Osmocote 15-9-12 at 10g/ pot	15.43a
Osmocote 15-9-12 at 15g/ pot	15.50a
1 tbsp 14-14-14 + 1 tbsp 45-0-0/ 5 gal water/ 1 cup/ plan/ week (Recommended rate)	15.17a
Recommended rate + 5g osmocot 15-9-12/ pot	15.33a
Recommended rate + 10g osmocote 15-9-12/ pot	15.33a
Recommended rate + 15g osmocote 15-9-12/ pot	15.53a

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

Width of Spathe

Result show that there were no significantly differences from the fertilized plants ranging a mean of 10.47 to 12.73 cm. Although, plants applied with 15g osmocote 15-9-12/ pot show the widest spathe with a mean of 12.73 cm followed by plants applied osmocote 15-9-12 at 15g/ pot + recommended rate. The control plants had the narrower spathe with a mean of 6.83 cm.

Table 7. Width of spathe (cm)

TREATMENTS	MEAN (cm)
0-0-0 (control)	6.83b
Osmocote 15-9-12 at 5g/ pot	10.47a
Osmocote 15-9-12 at 10g/ pot	11.43a
Osmocote 15-9-12 at 15g/ pot	12.73a
1 tbsp 14-14-14 + 1 tbsp 45-0-0/ 5 gal water/ 1 cup/ plant/ week (Recommended rate)	12.17a
Recommended rate + 5g osmocote 15-9-12/ pot	11.80a
Recommended rate + 10g osmocote 15-9-12/ pot	12.07a
Recommended rate + 15g osmocote 15-9-12/ pot	12.67a

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

Cutflower Stem Length

Table 8 presents the cutflower stem length of anthurium flowers. Statistical analysis showed no significant differences on the stem length of anthurium flowers at harvest. Although, among the fertilized plants, those applied with 15g osmocote 15-9-12/ pot + recommended rate had the longest cutflower stems measuring 65.00 cm. All other fertilized plants had longer stems ranging from52.33 cm to 64.33 cm, compared to control having a mean of 46.00 cm.

Mendiola (1976) said that application of proper amount of nitrogen in plants encourage stem development.

Table 8. Cutflower stem length (cm)

TREATMENTS	MEAN (cm)
No fertilizer (control)	46.00a
Osmocote 15-9-12 at 5g/ pot	53.67a
Osmocote 15-9-12 at 10g/ pot	56.33a
Osmocote 15-9-12 at 15g/ pot	64.00a
1 tbsp 14-14-14 + 1 tbsp 45-0-0/ 5 gal water/ 1 cup/ plant/ week (Recommended rate)	52.33a
Recommended rate + 5g osmocote 15-9-12/ pot	64.33a
Recommended rate + 10g osmocote 15-9-12/ pot	64.33a
Recommended rate + 15g osmocote 15-9-12/ pot	65.00a

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

Sotero (2004) found that 60 g osmocote 18-6-12 significantly promoted vegetative growths with longest stem cutflower of the Lily of the Nile.

Small Sized Cutflowers

Table 9 shows that there were significant effects of the fertilizer applied with regards to the cutflower yield particularly on small sized cutflowers. Osmocote 15-9-12 at 15g/ pot + the recommended rate has the highest small sized cutflowers produced with a mean of 19.33 followed by 15g osmocote 15-9-12/ pot alone with 17.33. The control produced 9.33 small sized cutflowers.

Table 9. Small sized cutflowers

TREATMENTS	MEAN
0-0-0 (control)	9.33b
Osmocote 15-9-12 at 5g/ pot	10.00b
Osmocote 15-9-12 at 10g/ pot	12.67ab
Osmocote 15-9-12 at 15g/ pot	17.33a
1 tbsp 14-14-14 + 1 tbsp 45-0-0/ 5 gal water/ 1 cup/ plant/ week (Recommended rate)	12.67ab
Recommended rate + 5g osmocote 15-9-12/ pot	14.00ab
Recommended rate + 10g osmocote 15-9-12/ pot	16.00ab
Recommended rate + 15g osmocote 15-9-12/ pot	19.33a

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

Medium Sized Cutflower

Significantly more medium sized flowers were harvested when applied with 15 g osmocote 15-9-12/ pot + recommended rate with a mean of 14.00 flowers. However, it was statistically comparable with the flower production of plants applied with 15g osmocote 15-9-12/ pot alone with a mean of 11.33 flowers.

The least number of flowers were produced by the recommended rate with a mean of 6.00 medium flowers. However, it was statistically comparable with the control and 5g osmocote 15-912/ pot alone having a mean of 6.67 and 7.33 flowers, respectively

Table 10. Medium sized cutflowers

TREATMENTS	MEAN
0-0-0 (control)	6.67cd
Osmocote 15-9-12 at 5g/ pot	7.33cd
Osmocote 15-9-12 at 10g/ pot	10.00bc
Osmocote 15-9-12 at 15g/ pot	11.33ab
1 tbsp 14-14-14 + 1 tbsp 45-0-0/ 5 gal water/ I cup/ plant/ week (Recommended rate)	6.00d
Recommended rate + 5g osmocote 15-9-12/ pot	7.33cd
Recommended rate + 10g osmocote 15-9-12/ pot	8.67bcd
Recommended rate + 15g osmocote 15-9-12/ pot	14.00a

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

Large Sized Cutflowers

Table 11 shows that anthurium plants applied with osmocote 15-9-12 at 5g/ pot + recommended rate had the highest large cutflowers with a mean of 6.67 flowers. Nevertheless, it was statistically comparable with the plants applied with 10g osmocote 15-9-12/ pot + recommended rate and in 15g osmocote 15-9-12/ pot alone with means of 6.00 and 5.33 flowers.

The least number of large cutflowers were obtained from the control and 5g osmocote 15-9-12/ pot alone with a mean of 2.00 flowers.

Table 11. Large sized cutflowers

TREATMENTS	MEAN
0-0-0 (control)	2.00c
Osmocote 15-9-12 at 5g/ pot	2.00c
Osmocote 15-9-12 at 10g/ pot	2.67c
Osmocote 15-9-12 at 15g/ pot	5.33ab
1 tbsp 14-14-14 + 1 tbsp 45-0-0/ 5 gal water/ 1 cup/ plant/ week (Recommended rate)	3.33bc
Recommended rate + 5g osmocote 15-9-12/ pot	2.67bc
Recommended rate + 10g osmocote 15-9-12/ pot	6.00a
Recommended rate + 15g osmocote 15-9-12/ pot	6.67a

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

Table 12. Cost and return analysis

TREATMENTS	CUTFLOWERS PRODUCED	GROSS INCOME	COST OF PRODUCTION	NET INCOME	ROI	RANK
0-0-0 (control)	181	1,032	824	208	25.24	3
5g/ pot osmocote 15-9-12	194	1,104	1,204	-100	-8.3	8
10g/ pot osmocote 15-9-12	254	1,451	1,384	67	4.84	6
15g/ pot osmocote 15-9-12	332	1,926	1,564	362	23.15	4
1 tbsp 14-14-14 + 1 tbsp 45-0-0/5 gal water; 1 cup/plant/week (recommended rate)	221	1,267	1,004	263	26.19	2
Recommended rate + 5g/pot osmocote 15-9-12	241	1,360	1,384	-24	-1.73	7
Recommended rate + 10g/ pot osmocote 15-9-12	307	1,802	1,564	238	15.22	5
Recommended rate + 15g/ pot osmocote 15-9-12	401	2,346	1,744	602	34.52	1

<u>Cost and Return Analysis</u>

In the cost and return analysis, highest ROI of 34.52% was obtained with the application of 15g/ pot osmocote 15-9-12 + recommended rate of 1 tbsp 14-14-14 + 1 tbsp 45-0-0/ 5 gal water/ plant/ week as shown in table 12.

Plate 1. Overview of the study

Plate 2. 0-0-0 (control)

Plate 3. 5g osmocote 15-9-12/ pot

Plate 4. 10g osmocote 15-9-12/ pot

Plate 5. 15g osmocote 15-9-12/ pot

Plate 6. 1 tbsp 14-14-14 + 1 tbsp 45-0-0/ 5 gal water/ 1 cup/ plant/ week (recommended Rate)

Plate 7. Recommended rate + 5g osmocote 15-9-12/ pot

Plate 8. Recommended rate +10g osmocote 15-9-12/ pot

SUMMARY, CONCLUSION, RECOMMENDATION

Summary

The study was conducted to evaluate the effects of osmocote 15-9-12 controlled release fertilizer on the vegetative, reproductive growth, yield of anthurium; to compare the effects of osmocote 15-9-12 with the recommended practice of fertilizer application in relation to the growth, flowering and yield of anthurium; and to determine the economics of applying osmocote 15-9-12 in anthurium cutflower production. The study was conducted at Ornamental Horticulture Research Area, Benguet State University, La Trinidad, Benguet from December, 2007 to April, 2008.

Result show that the tallest plants at harvesting stage were measured from those applied with the rate of osmocote 15-9-12 at 15g/ pot + the recommended rate of 1 tbsp 14-14-14 + 1 tbsp 45-0-0/ 5 gal water/ 1 cup/ plant/ week followed by those applied with the lower rate of 10g osmocote 15-9-12/ pot + the recommended rate.

Number of leaves per plant was higher in all fertilized plants compared to the untreated plants (control), although differences were statistically comparable.

Days to flower bud formation were statistically different in all treatments. Earliest to form and mature flower bud obtained on plants applied with osmocote 15-9-12 at 15g/ pot + recommended rate. As to number of days from harvesting of the first flower to formation of the second flower, osmocote 15-9-12 at higher rate of 15g/ pot were earliest to form flower bud at 1 cm bud size. However, all treatments are statistically comparable.

Cutflower stem length at harvesting stage were not statistically different in all treatments. However, longer cutflower stem were harvested from palnts applied with 15g osmocote 15-9-12/ pot + recommended rate with a mean of 65.00 cm.

Longest spathe length were obtained from 15g osmocote 15-9-12/ pot + recommended rate having a mean of 15.53 cm. The control had the shortest spathe with a mean of 10.17 m. Widest spathe were recorded on plants applied with fertilizer compared to the control.

On the other hand, the number of cutflower produced was higher with the application of higher rates of fertilizer. Result shows that the plants applied with 15g osmocote 15-9-12/ pot + recommended rate produced the highest number of cutflowers harvested for the cropping period.

Conclusion

Based on the above findings, it is concluded that application of 15g osmocote 15-9-12/ pot + 1 tbsp 14-14-14 + 1 tbsp 45-0-0/ 5 gal water at 1 cup/ plant/ week significantly improved the vegetative growth, enhanced flowering, highest yield with higher number of large sized cutflowers and highest ROI.

Recommendation

Based from the preceeding results and discussion, application of osmocote 15-9-12 as a slow release fertilizer at the rate of15g/ pot + 1 tbsp 14-14-14 + 1 tbsp 45-0-0/ 5 gal water/ 1 cup/ plant/ week is recommended in growing anthurium cv. Kansako cutflower production to improve the vegetative growth, enhanced flowering, highest yield and highest ROI.

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APPENDICES

APPENDIX TABLE 1. Initial height (cm)

TREATMENTS	REPLICATION			TOTAL	MEAN
	I	II	III		
T_1	44	57	61	162	54.00
T_2	52	61	50	163	54.33
T_3	60	50	77	215	71.67
T_4	61	76	76	213	71.00
T_5	60	73	69	202	67.33
T_6	76	67	66	209	69.67
T_7	83	86	70	239	79.67
T_8	90	101	85	276	92.00

ANALYSIS OF VARIANCE

SOURCE OF VARIANCE	DEGREES OF FREEDOM	SUM OF SQUARES	MEAN SQUARE	F VALUE	TABULATED F	
					0.05	0.01
Replication	2	339.083	169.542			
Factor A	7	3269.625	467.089	9.76*	2.77	4.58
Error	14	670.250	47.875			
Total	23	4278.958				

*- Significant Coefficient of Variation: 9.89%

APPENDIX TABLE 2. Final height at harvesting stage (cm)

TREATMENTS	REPLICATION			TOTAL	MEAN
	I	II	III		
T_1	46	60	66	172	57.33
T_2	55	66	56	177	59.00
T_3	71	80	80	231	77.00
T_4	74	79	80	233	77.67
T_5	69	76	75	220	73.33
T_6	83	72	70	225	75.00
T_7	90	91	76	257	85.67
T_8	96	105	88	289	96.33

ANALYSIS OF VARIANCE

SOURCE OF VARIANCE	DEGREES OF FREEDOM	SUM OF SQUARES	MEAN SQUARE	F VALUE	TABULATED F	
					0.05	0.01
Replication	2	146.583	73.292			
Factor A	7	3452.000	493.143	11.05**	2.77	4.58
Error	14	624.750	44.625			
Total	23	4223.333				

**-Highly significant

Coefficient of Variation: 8.89%

APPENDIX TABLE 3. Initial number of leaves per plant

TREATMENT	REPLICATION			TOTAL	MEAN
	I	II	III		
T_1	3	4	3	10	3.33
T_2	4	5	4	13	4.33
T_3	5	5	4	14	4.67
T_4	5	7	5	17	5.67
T_5	5	5	7	17	5.67
T_6	7	5	5	17	5.67
T_7	6	7	5	18	6.00
T_8	7	6	6	19	6.33

ANALYSIS OF VARIANCE

SOURCE OF VARIANCE	DEGREES OF FREEDOM	SUM OF SQUARES	MEAN SQUARE	F VALUE	TABULATED F	
					0.05	0.01
Replication	2	4.000	2.000			
Factor A	7	11.625	1.661	2.91*	2.77	4.58
Error	14	8.000	0.571			
Total	23	23.625				

*- Significant Coefficient of Variation: 8.89%

APPENDIX TABLE 4. Number of leaves per plant at harvesting stage

TREATMENTS	REPLICATION			TOTAL	MEAN
	I	II	III		
T_1	3	4	3	10	3.33
T_2	4	5	4	13	4.33
T_3	5	5	4	14	4.67
T_4	5	7	5	17	5.67
T_5	5	5	7	17	5.67
T_6	7	5	5	17	5.67
T_7	6	7	5	18	6.00
T_8	7	6	6	19	6.33

ANALYSIS OF VARIANCE

SOURCE OF VARIANCE	DEGREES OF FREEDOM	SUM OF SQUARES	MEAN SQUARE	F VALUE	TABULATED F	
					0.05	0.01
Replication	2	1.583	0.792			
Factor A	7	21.292	3.042	3.84*	2.77	4.58
Error	14	11.083	0.792			
Total	23	33.958				

*-Significant

Coefficient of Variation: 17.08%

APPENDIX TABLE 5. Initial stem thickness (cm)

TREATMENTS	REPLICATION I	II	III	TOTAL	MEAN
T_1	1.0	1.19	1.10	3.29	1.097
T_2	1.0	1.0	1.35	3.35	1.117
T_3	1.64	1.68	1.38	4.7	1.567
T_4	1.60	1.57	1.73	4.9	1.633
T_5	1.71	1.73	1.36	4.8	1.6
T_6	1.68	1.70	1.48	4.86	1.62
T_7	1.78	1.98	1.53	5.29	1.763
T_8	1.83	1.71	2.31	5.85	1.95

ANALYSIS OF VARIANCE

SOURCE OF VARIANCE	DEGREES OF FREEDOM	SUM OF SQUARES	MEAN SQUARE	F VALUE	TABULATED F 0.05	0.01
Replication	2	0.009	0.004			
Factor A	7	1.839	0.263	6.36**	2.77	4.58
Error	14	0.578	0.041			
Total	23	2.426				

**-Highly significant

Coefficient of Variation: 13.17%

APPENDIX TABLE 6. Stem thickness at flowering (cm)

TREATMENTS	REPLICATION			TOTAL	MEAN
	I	II	III		
T_1	1.0	1.25	1.13	3.38	1.127
T_2	1.5	1.0	1.38	3.88	1.193
T_3	1.75	1.75	1.40	4.9	1.633
T_4	1.63	1.63	1.80	5.06	1.687
T_5	1.75	1.75	1.40	4.9	1.633
T_6	1.75	1.75	1.50	5.0	1.667
T_7	2.0	2.1	1.55	5.65	1.883
T_8	2.0	1.75	2.40	6.15	2.05

ANALYSIS OF VARIANCE

SOURCE OF VARIANCE	DEGREES OF FREEDOM	SUM OF SQUARES	MEAN SQUARE	F VALUE	TABULATED F	
					0.05	0.01
Replication	2	0.043	0.021			
Factor A	7	1.784	0.255	5.11**	2.77	4.58
Error	14	0.699	0.050			
Total	23	2.526				

**-Highly significant

Coefficient of Variation: 13.82%

APPENDIX TABLE 7. Number of days from harvesting of the 1st flower to formation of the 2nd

TREATMENTS	REPLICATION			TOTAL	MEAN
	I	II	III		
T_1	44	57	61	162	54.00
T_2	1.5	1.0	1.38	3.88	1.193
T_3	1.75	1.75	1.40	4.9	1.633
T_4	1.63	1.63	1.80	5.06	1.687
T_5	1.75	1.75	1.40	4.9	1.633
T_6	1.75	1.75	1.50	5.0	1.667
T_7	2.0	2.1	1.55	5.65	1.883
T_8	2.0	1.75	2.40	6.15	2.05

ANALYSIS OF VARIANCE

SOURCE OF VARIANCE	DEGREES OF FREEDOM	SUM OF SQUARES	MEAN SQUARE	F VALUE	TABULATED F	
					0.05	0.01
Replication	2	0.043	0.021			
Factor A	7	1.784	0.255	5.11**	2.77	4.58
Error	14	0.699	0.050			
Total	23	2.526				

**-Highly significant Coefficient of Variation: 13.82%

APPENDIX TABLE 8. Number of days from visible flower bud formation to harvesting Stage

TREATMENTS	REPLICATION			TOTAL	MEAN
	I	II	III		
T_1	90	90	88	268	89.333
T_2	83	90	87	260	86.667
T_3	79	75	85	239	79.667
T_4	69	64	75	208	69.333
T_5	67	63	64	194	64.667
T_6	73	69	79	221	73.667
T_7	63	64	62	189	63.000
T_8	52	58	66	176	58.667

ANALYSIS OF VARIANCE

SOURCE OF VARIANCE	DEGREES OF FREEDOM	SUM OF SQUARES	MEAN SQUARE	F VALUE	TABULATED F	
					0.05	0.01
Replication	2	83.250	41.625			
Factor A	7	2659.958	379.994	24.69**	2.77	4.58
Error	14	215.417	15.387			
Total	23	2958.625				

**-Highly significant   Coefficient of Variation: 5.36%

APPENDIX TABLE 9. Length of spathe (cm)

TREATMENTS	REPLICATION			TOTAL	MEAN
	I	II	III		
T_1	10.5	11.5	8.5	30.5	10.17
T_2	15.2	12.3	12.5	40.0	13.3
T_3	14.0	16.0	16.3	46.3	15.43
T_4	16.0	16.5	14.0	46.5	15.5
T_5	14.0	14.0	15.0	43.0	14.33
T_6	14.3	15.2	16.0	45.5	15.17
T_7	15.0	15.0	16.0	46.0	15.33
T_8	14.5	15.6	16.5	46.6	16.53

ANALYSIS OF VARIANCE

SOURCE OF VARIANCE	DEGREES OF FREEDOM	SUM OF SQUARES	MEAN SQUARE	F VALUE	TABULATED F	
					0.05	0.01
Replication	2	0.043	0.211			
Factor A	7	72.193	10.313	6.91**	2.77	4.58
Error	14	20.904	1.493			
Total	23	93.520				

**-Highly significant   Coefficient of Variation: 8.52%

APPENDIX TABLE 10. Width of spathe

TREATMENTS	REPLICATION			TOTAL	MEAN
	I	II	III		
T_1	5.0	9.0	6.5	20.5	6.83
T_2	11.4	11.0	9.0	31.4	10.47
T_3	10.5	12.8	11.0	34.3	11.43
T_4	13.5	12.2	12.5	38.2	12.73
T_5	11.0	12.0	13.5	36.5	12.17
T_6	12.0	13.0	10.4	35.4	11.8
T_7	12.2	12.5	11.5	36.2	12.07
T_8	12.2	12.5	13.3	38.0	12.67

ANALYSIS OF VARIANCE

SOURCE OF VARIANCE	DEGREES OF FREEDOM	SUM OF SQUARES	MEAN SQUARE	F VALUE	TABULATED F	
					0.05	0.01
Replication	2	4.381	2.190			
Factor A	7	78.503	11.215	8.38**	2.77	4.58
Error	14	18.726	1.338			
Total	23	101.610				

**-Highly significant Coefficient of Variation: 10.26%

APPENDIX TABLE 11. Cutflower stem length at harvesting stage (cm)

TREATMENTS	REPLICATION			TOTAL	MEAN
	I	II	III		
T_1	50	46	42	138	46.00
T_2	50	61	50	161	53.67
T_3	58	57	54	169	56.33
T_4	67	58	67	192	64.00
T_5	64	67	56	187	62.33
T_6	73	64	56	193	64.33
T_7	72	65	56	193	64.33
T_8	68	71	56	195	65.00

ANALYSIS OF VARIANCE

SOURCE OF VARIANCE	DEGREES OF FREEDOM	SUM OF SQUARES	MEAN SQUARE	F VALUE	TABULATED F	
					0.05	0.01
Replication	2	175.750	87.875			
Factor A	7	1087.167	155.310	2.26ns	2.77	4.58
Error	14	963.583	68.827			
Total	23	2226.500				

Ns-not significant Coefficient of Variation: 14.24%

APPENDIX TABLE 12. Small sized cutflowers

TREATMENTS	REPLICATION			TOTAL	MEAN
	I	II	III		
T_1	6	12	10	28	9.33
T_2	10	12	8	30	10.00
T_3	14	12	12	38	12.67
T_4	22	14	16	52	17.33
T_5	10	16	12	38	12.67
T_6	14	10	18	42	14.00
T_7	19	15	14	48	16.00
T_8	22	22	14	58	19.33

ANALYSIS OF VARIANCE

SOURCE OF VARIANCE	DEGREES OF FREEDOM	SUM OF SQUARES	MEAN SQUARE	F VALUE	TABULATED F	
					0.05	0.01
Replication	2	11.083	5.542			
Factor A	7	254.500	36.357	3.18*	2.77	4.58
Error	14	160.250	11.446			
Total	23	425.833				

*-Significant Coefficient of Variation: 24.31%

APPENDIX TABLE 13. Medium sized cutflowers

TREATMENTS	REPLICATION			TOTAL	MEAN
	I	II	III		
T_1	4	8	8	20	6.67
T_2	7	8	7	22	7.33
T_3	12	10	8	30	10.00
T_4	12	10	12	34	11.33
T_5	6	5	7	18	6.00
T_6	8	8	6	22	7.33
T_7	12	8	6	26	8.67
T_8	12	14	16	42	14.00

ANALYSIS OF VARIANCE

SOURCE OF VARIANCE	DEGREES OF FREEDOM	SUM OF SQUARES	MEAN SQUARE	F VALUE	TABULATED F	
					0.05	0.01
Replication	2	0.583	0.292			
Factor A	7	154.500	22.071	5.86**	2.77	4.58
Error	14	52.750	3.768			
Total	23	207.833				

**-Highly significant Coefficient of Variation: 21.77%

APPENDIX TABLE 14. Large sized cutflowers

TREATMENTS	REPLICATION			TOTAL	MEAN
	I	II	III		
T_1	2	2	2	6	2.00
T_2	2	2	2	6	2.00
T_3	2	2	4	8	2.67
T_4	4	6	6	16	5.33
T_5	2	6	2	10	3.33
T_6	2	4	2	8	2.67
T_7	6	6	6	18	6.00
T_8	8	4	8	20	6.67

ANALYSIS OF VARIANCE

SOURCE OF VARIANCE	DEGREES OF FREEDOM	SUM OF SQUARES	MEAN SQUARE	F VALUE	TABULATED F	
					0.05	0.01
Replication	2	1.333	0.667			
Factor A	7	74.000	10.571	5.29**	2.77	4.58
Error	14	28.000	2.000			
Total	23	103.333				

**-Highly significant

Coefficient of Variation: 36.89%