BIBLIOGRAPHY

CADPINO, CAJOJO L. APRIL 2007. Performance of Celery ('Tall Utah') as Affected by Volume and Frequency of Irrigation. Benguet State University, La Trinidad, Benguet.

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ABSTRACT

The study was conducted at the Balili Experimental Station of Benguet State University, La Trinidad, Benguet from October 2006 to February 2007 to determine the effects of volume and frequency of irrigation on the yield of celery, establish the best volume of water to apply; and the best interval of irrigation for the crop under the conditions of the locality, and determine the economics of celery production as affected by the irrigation treatments.

Results revealed that volume and interval of irrigation significantly affected leaf length, circumference of the bunch and petiole length at harvest in celery 'Tall Utah'.

Marketable, total and computed yields were significantly higher in plants with an irrigation volume of 5 li/m^2 water applied every two days interval and 10 li/m^2 water applied every four days.

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INTRODUCTION

Vegetable growing is number one industry and the main sources of income of Benguet farmers. In many parts of the country, vegetable constitutes a large part of a diet. Some vegetables are salad crops suited for the climate of the province and one of them is celery.

Celery (*Apium graveolens*) is a native of Mediterranean and adjacent areas. It is a mesophyte. This is distinctly a cool season crop, which thrives best on sandy or silt loam soil with sufficient organic matter and a soil pH ranging from 6.0 to 6.8 (Knott and Deanon, 1967).

Although it is a minor crop in the Philippines, celery is considered an important commercial crop around the world because it is utilized in homes and restaurants as appetizers, flavoring herb for broth, soups, dressings as well as excellent vegetable either stewed or creamed, and as salads (Thompson and Kelly, 1959). It is also a good source of vitamin C, calcium, and food energy (Knott and Deanon,1967).

Celery has a broad vegetative growth and extensive root system, thus requires adequate water supply. Most farmers in the locality do not follow an irrigation program for the vegetable crops that they grow in terms of the volume of water to apply and the interval of irrigation. However, improper irrigation practices could result to under or over supply of water leading to poor crop stand. Results of this study, therefore, could serve as guide on appropriate irrigation practices in celery production for our vegetable growers.

The study was conducted at the Balili Experimental Station of Benguet State University, La Trinidad, Benguet from October 2006 to February 2007 to determine the effects of volume and frequency of irrigation on the yield of celery, establish the best amount of water to apply and interval of irrigation for the crop under the conditions of the locality, and determine the economics of celery production as effected by irrigation.

REVIEW OF LITERATURE

Water is precious component of human life. The ways by which it sustains everyday activities are innumerable. In the field of agriculture, particularly irrigation systems and irrigated farm units, essentiality of water has forced men to manage it effectively (PCARRD, 1983).

Schwab (1993) said that irrigation provides one of the greatest opportunities for increasing crop production as well as improving germination, controlling air temperature, and applying chemicals with the irrigation water. If the annual rainfall is less than 250 mm, irrigation becomes a necessity. Moreover, if rainfall is from 250 to 500 mm, then crop production is limited unless the land is irrigated; and when rainfall is more than 500 mm, irrigation is often required for maximum production.

Whether a crop is planted in the humid east with modem water pivot sprinkler system or in a desert land which is converted to bush productive land, the basic needs are the same: productive soils, adequate drainage, and a reliable supply of good quality water. Schwab (1993) added that relatively large quantities of water are required to satisfy the needs of the crop and to supply convergence, evaporation and seepage losses.
Hansen (1997) stated that the need for irrigation has been brought forcibly to the attention of farmers throughout the world because of severe droughts that have affected several areas. Although sufficient rainfall may be available for the growing of crops in normal years, it has been found through costly experience that short periods without rainfall have ruined crops that would otherwise have brought ample returns to the farmers.

Linsley (1992) stated that water application during irrigation of the soil enters the plants in the form of extract water from the soil for their growth. The soil actually serves as a reservoir in which water is stored for use by plants between irrigation. The storage and movement of their soil water are important factors in irrigation planning. Irrigation must be scheduled according to water accessibility and crop need, knowing when to irrigate and how much water is required. If adequate water supplies are available, irrigation is usually provided to obtain optimum or maximum yield. However, over irrigation should be avoided as this can decrease yield by increasing soil erosion.

According to Knott (1957), frequency of irrigation depends on the total supply of available moisture reached by the roots and the amount of water used. The field is affected by soil type, depth of wetted soil and dispersion of roots. The latter is influenced by weather conditions and the age of the crop.

In addition to these, Thompson and Kelly (1959) claimed that the frequency of watering and the quantity of water that should be applied depend on the depth of soil which the roots penetrates, utilization of water by the crop and loss of water in proportion to the surface of the soil.

Donahue (1970) reported that there are still variations due to the differences in the soil temperature, relative humidity, wind movement, and soil fertility. Plant growth is affected by the concentration of the soil solution is the saline soil as well as the lack of moisture tension and suction. The concentration depends on the amount of water to dissolve salts.

Moreover, Briggs and Shants (1973) stated that water requirement is profoundly affected by atmosphere conditions. One of the conditions is relative different periods of the year show great differences. The lower the relative humidity at a given temperature, evaporation, and transpiration rate increase temperature; and decrease with increase in relative humidity.

Ware (1975) found that to maintain succulence and tenderness, the plant usually requires a continuous supply of water through its development. Furthermore, Buckman and Brady (1969) reported that large quantities of water must be supplied to satisfy the water requirements of growing plants. Soil moisture helps control other important components essential to normal plant growth, soil aeration and soil temperature.

On the other hand, Chapman and Carter (1976) also stated that the amount of water used is directly related to the yield in all crops, as yield increases, total water used increases because more water is needed for increased plant growth with in the limits of available moisture and others.

However, Chapman and Carter (1976) reported that excessive moisture can reduce crop yield. They point out that yield reduction due to excessive moisture is related to poor aeration of the soil and reduced oxygen supply for the plant respiratory needs.

Similarly, the Agro-Industrial Guide as cited by Somera (1981), reported that frequency of irrigation is dependent upon the type of soil, amount of rainfall, condition of the crop and variety.

According to Malamug (1987), the plan for water generally specifies the rules for water allocation, relating to both amounts and timing, and the roles of all those concerned. Plans for irrigation system maintenance usually include provision for routine and special activities that are accompanied by the specification of duties for the individuals and groups who are assigned responsibilities.

Irrigation is an essential requirement in the farm when rainfall is not available.

Without the irrigation water, the selection of the varieties, application of adequate fertilizer, insect and disease control and the practice of improved cultural management alone can not insure the production of crops with maximum economic returns. Caoili *et al*. (1997) as cited by Sayucop (2004), stated that adequate supply of irrigation water makes the soil more workable; maintain a favorable condition in the soil for the plant growth, dissolve effectively the native and applied fertilizers thereby, making it readily available for plants.

At present, the need for water in agriculture is even greater. In many places, rainfall is either too little or too unreliable to guarantee a good harvest, so irrigation seemed to be the ideal solution for feeding a hungry planet. As a result of dependence on irrigated crops, agriculture takes a major of the plant supply of fresh water and the major problem in agriculture is irrigation, food storage and transportation in many nations (Anon, 2001) as cited by Sayucop (2004).

Very recently, Sayucop (2004) revealed that irrigation interval did not significantly affect maturity of heads in cabbage heading percentage, and weight of non-marketable heads. Head size was significantly larger with two days irrigation interval. Head weight, marketable, total, and computed yields were significantly higher in plants irrigated every two or four days. He added that, a positive return on investment (ROI) was obtained with four days irrigation and every two days irrigation frequency.

MATERIALS AND METHODS

Materials

The materials used were celery seeds (‘Tall Utah), fertilizers, fungicides, insecticides, chicken manure, bamboo, 15 liter pail and transparent plastic sheets as cover for the seedlings.

Methods

Experimental design and treatments. The experiment was laid out following the randomized complete block design (RCBD) with four replications.

Code	Irrigation Volume (li/m^2)	Frequency (day intervals)
I_1	5	2
I_2	10	4
I_3	15	6
I_4	20	8

Growing seedlings. The seeds were sown ahead of time in a well-prepared seedbed under a plastic tunnel. One month after emergence, the seedlings were pricked. After another month, the pricked seedlings were transplanted.

Land preparation. An area of 80 m^2 was prepared for the study. The area was divided into four blocks with four plots per block with a dimension of 1 m x 5 m each. Each plot was applied with decomposed chicken dung at the rate of one- half kerosene can (16 li capacity). The chicken dung was mixed thoroughly with the soil before transplanting.

Irrigation. Irrigation was done just after transplanting and every other day for two times after which the irrigation treatments were imposed.

Care and maintenance. All other recommended practices required in the production of celery like cultivation, pest control, and fertilizer application were uniformly employed to all treatment plots.

Data gathering. The data gathered and subjected to variance analysis and mean separation test by Duncan's multiple range test (DMRT) were as follows:

1. Leaf length (cm). Ten sample plants were measured from the base of the leaf petioles up to the tip the leaf during harvest.

2. Circumference of the bunch (cm). This was taken by individually measuring ten sample plants per treatment plot with the use of measuring tape .

3. Soil moisture content (%). The soil moisture content before irrigation in each treatment was taken using the formula:

Moisture content (%) = Fresh weight - Oven dry weight ¸ Oven dry weight x 100

4. Length of petioles (cm). This was measured from the base of the leaf petiole up to the node where first leaflets arise from ten sample plants per treatment at harvest.

5. Average weight of plants (g). This was taken by dividing the total weight of plants per plot by the number of plants harvested per plot.

6. Total yield per plot (kg). This was the weight of all the plants harvested in each plot.

7. Non-marketable yield per plot (kg). This was the weight of plants that are very small,

with deformities, and severely damaged by insects and diseases.

8. Marketable yield per plot (kg). This was the weight of plants without deformities or damages that could be sold in the market.

9. Computed yield (t/ha). The yield per plot was converted to yield per hectare by multiplying with 2,000 plots based on the plot size used.

10. Economic analysis. All expenses incurred in the study were recorded. The return on investments (ROI) was computed using the formula:

ROI= Gross Sales - Expenses ¸ Expenses x 100

11. Documentation of the study through pictures.

11. Other observations.

RESULTS AND DISCUSSION

Leaf Length

Table 1 shows that significantly longer leaves were obtained with irrigation at 5 li/m^2 every two days and 10 li/m^2 every four days. This indicate that more frequent irrigation enhances growth of leaves in celery.

Bunch Circumference

The circumference of the bunch was significantly wider with 5 li/m^2 applied every two days and 10 li/m^2 every four days (Table 2). Circumference of the bunch decreases as the volume of water increased with longer irrigation intervals.

Petiole Length

As shown in Table 3, length of petiole was significantly longer when applied with 5 li/m^2 every two days and irrigation at 10 li/m^2 every four days. Applying irrigation water at lower volume but more frequently promoted elongation of the petiole. This result is desirable since longer plants in celery is preferred in the local market.

Table 1. Leaf length

IRRIGATION VOLUME (li/m^2)	FREQUENCY (day intervals)	MEAN (cm)
5	2	58.92a
10	4	58.68a
15	6	56.74b

20	8	55.96b

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

Table 2. Circumference of the bunch

IRRIGATION VOLUME (li/m^2)	FREQUENCY (day intervals)	MEAN (cm)
5	2	15.18a
10	4	14.50ab
15	6	13.83bc
20	8	13.65c

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

Table 3. Petiole length

IRRIGATION VOLUME (li/m^2)	FREQUENCY (day intervals)	MEAN (cm)
5	2	23.71a
10	4	22.95ab
15	6	22.56b
20	8	22.54b

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

Yield

Average plant weight, marketable, total and computed yield were significantly higher with irrigation at 5 li/m^2 every two days (Table 4). There were no significant differences observed on non-marketable yield. Findings show that yield of celery increased with lower volume of water applied but with more frequent applications since it is a shallow-rooted crop.

Table 4. Yield

IRRIGATION VOLUME (li/m^2)	FREQUENCY (day intervals)	AVERAGE PLANT WEIGHT (g)	MARKETABLE (kg/plot)	NON-MARKETABLE (kg/plot)	TOTAL (kg/plot)	COMPUTED MARKETABLE (t/ha)
5	2	288.75a	20.80a	0.80a	21.60a	41.60a
10	4	249.50b	17.98b	0.85a	18.83b	35.95b
15	6	221.25c	14.88c	1.08a	15.95c	29.75c
20	8	205.75c	13.75c	1.08a	14.83c	27.50c

In a column, means with a common letter are not significantly different at 5% level by DMRT

Soil Moisture Content

The moisture content of the soil did not differ significantly before the imposition of the irrigation treatments (Table 5).

Cost and Return Analysis

The cost and return analysis in celery production as affected by volume and frequency of irrigation is shown in Table 6. Negative return on investment (ROI) were obtained from all the treatments. This is so because the price of celery at the time harvest was only PhP 6.00/kg.

Other Observations

The identified insect pests infesting the plants were leafminers and cutworms. As to the diseases observed, leafspot and leaf blight were noted. Control preventive measures were done to minimize pests damage in the crop.

Table 5. Soil moisture content

IRRIGATION VOLUME (li/m^2)	FREQUENCY (day intervals)	MEAN (%)
5	2	32.53a
10	4	32.56a
15	6	32.72a
20	8	31.78a

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

Table 6. Economic analysis

PARTICULARS	IRRIGATION VOLUME/FREQUENCY 5 li/m^2/2 days	10 li/m^2/4 days	15 li/m^2/6 days	20 li/m^2/8 days
Yield (kg/20m^2)	83.20	71.90	59.50	55.00
Gross sales (PhP)	499.20	431.40	357.00	330.00
Expenses (PhP)				
Seeds	12.50	12.50	12.50	12.50
Chicken manure	37.50	37.50	37.50	37.50
Lime	23.75	23.75	23.75	23.75
D-10	34.38	34.38	34.38	34.38
46-0-0	25.00	25.00	25.00	25.00
14-14-14	22.50	22.50	22.50	22.50
Trigard	93.75	93.75	93.75	93.75
Gasoline	112.00	104.00	96.00	88.00
Labor	300.00	225.00	135.00	120.00
Transportation	25.00	25.00	25.00	25.00
Total Expenses (PhP)	686.38	603.38	505.38	482.38
Net income (PhP)	-187.18	-171.98	-148.38	-152.38
ROI (%)	-27.27	-28.50	-29.36	-31.60
Rank	1	2	3	4

Note: Selling price was PhP 6.00/kg

Documentation of the Study
through Pictures

Figure 1 shows an overview of the experimental plants and the harvested bunch produced from the four irrigation volume and frequency of intervals.

SUMMARY, CONCLUSION AND RECOMMENDATION

Summary

The study was conducted at the Balili Experimental Station of Benguet State University, La Trinidad, Benguet from October 2006 to February 2007 to determine the effects of volume and frequency of irrigation on the yield of celery, establish the best volume of water to apply; and the best interval of irrigation for the crop under the conditions of the locality, and determine the economics of celery production as affected by the irrigation treatments.

Results reveal that leaf and petiole length and the circumference of the bunch were significantly longer with irrigation at 5 li/m^2 every two days or 10 li/m^2 every four days.

Marketable yield at 41.60 t/ha was, however, significantly higher when irrigation was done at 5 li/m^2 every two days.

Return on investment was negative all the irrigation treatments on account of the low market price at harvest time. Nevertheless, it was less negative with irrigation at 5 li/m^2 every two days.

Conclusion

It is therefore concluded that application of irrigation water in celery should be done at 5 li/m^2 water every two days to promote vegetative growth and obtain higher yield.

Recommendation

Based on the results of this irrigation study on celery, irrigation water at 5 li/m^2 applied two days is recommended.

LITERATURE CITED

BRIGGS, L. and SHANTZ. 1973. Water requirement of plants. USDA-BPI Bull. 285.

BUCKMAN, H.C. and N.C. BRADY. 1969. The Nature and Properties of Soils. New York: Mac Millan Book Co. Pp. 152-161.

CHAPMAN, S.R. and L.P. CARTER. 1976. Crop Production, Principles and Practices. San Francisco: W.H. Freeman and Co. P. 419.

DONAHUE, R. and J.C. SHICKLUNA. 1970. An Introduction to Soils and Plant Growth. New Jersey: Prentice Hall Inc. Pp. 211, 214-216.

HANSEN, V.E. *et al.* 1997. Irrigation and Practices. New York: John Wiley and Sons. Pp. 3-6.

KNOTT, J.E. 1957. Vegetable Production in Southeast Asia. UPLB, Los Baños, Laguna. P. 3.

KNOTT, T.E. and J.E. DEANON. 1967. Vegetable Production in Southeast Asia. UPLB, Los Baños, Laguna. P. 83.

LINSLEY, R.K. *et al.* 1992. Water Resource Engineering. New York: Mc Granhill, Inc. Pp. 2-3.

MALAMUG, J.J.F. 1987. Operations performance study for increasing dry season water availability of a resevoir type communal irrigation system. MS Thesis. CLSU, Muñoz, Nueva Ecija. P. 3.

PCARRD. 1983. Philippine Recommends for Irrigation Management Lowland Crops Condition. Vol. 1. UPLB, Los Baños, Laguna. Pp. 1-3.

SCHWAB, G.O. *et al.* 1993. Soil and Water Conservation Engineering. New York: John Wiley and Sons, Inc. Pp. 3-4.

SAYUCOP, H. 2004. Performance of cabbage 'Scorpio' as affected by frequency of irrigation. BS Thesis. BSU, La Trinidad, Benguet. Pp. 7-8.

SOMERA, A.B. 1981. Effects of water stress on two varieties of bulb onion. MS Thesis. MSAC, La Trinidad, Benguet. P. 60.

THOMPSON, J.H. and C. KELLY. 1959. Vegetable Crops. New York: McGrawhill Book Co., Inc. Pp. 137-143.

WARE, G.W. 1975. Producing Vegetable Crops. Illinois: The Interstate Printers and Pub., Inc. Pp. 41, 251.

APPENDICES

Appendix Table 1. Leaf length (cm)

TREATMENT	REPLICATION I	II	III	IV	TOTAL	MEAN
I_1	59.83	60.35	59.10	56.41	235.69	58.92
I_2	59.70	59.88	58.30	56.85	234.73	58.68
I_3	58.38	59.28	56.65	52.63	226.94	56.74
I_4	56.32	56.59	57.15	53.79	223.85	55.96

Analysis of Variance

Source of variation	Degrees of freedom	Sum of squares	Mean square	Computed F	TABULAR F 0.05	0.01
Replication	3	40.670	13.557			
Factor A	3	25.392	8.464	10.58**	3.86	6.99
Error	9	7.202	0.800			
Total	15	73.264				

** = Highly significant

Coefficient of variation = 1.55%

Appendix Table 2. Circumference of the bunch (cm)

TREATMENT	REPLICATION				TOTAL	MEAN
	I	II	III	IV		
I_1	14.65	16.12	15.01	14.93	60.71	15.18
I_2	13.66	14.52	15.37	14.45	58.00	14.50
I_3	13.07	13.73	14.69	13.82	55.31	13.83
I_4	13.47	13.54	13.70	13.87	54.58	13.65

Analysis of variance

Source of variation	Degrees of freedom	Sum of squares	Mean square	Computed F	TABULAR F 0.05	TABULAR F 0.01
Replication	3	2.125	0.708			
Factor A	3	5.847	1.949	8.69**	3.86	6.99
Error	9	2.019	0.224			
Total	15	9.991				

** = Highly significant

Coefficient of variation = 3.32%

Appendix Table 3. Petiole length (cm)

TREATMENT	REPLICATION				TOTAL	MEAN
	I	II	III	IV		
I_1	24.06	24.44	23.94	22.40	94.84	23.71
I_2	23.30	23.93	22.31	22.24	91.78	22.95
I_3	23.25	23.30	22.70	21.00	90.25	22.56
I_4	23.24	22.21	22.41	22.28	90.14	22.54

Analysis of variance

Source of variation	Degrees of freedom	Sum of squares	Mean square	Computed F	TABULAR F 0.05	TABULAR F 0.01
Replication	3	5.942	1.981			
Factor A	3	3.598	1.199	4.09*	3.86	6.99
Error	9	2.639	0.293			
Total	15	12.179				

* = Significant

Coefficient of variation = 2.36%

Appendix Table 4. Marketable yield (kg/plot)

TREATMENT	REPLICATION I	II	III	IV	TOTAL	MEAN
I_1	21.8	19.6	19.8	22.0	83.20	20.80
I_2	17.5	17.6	19.0	17.8	71.90	17.98
I_3	15.0	14.0	15.0	15.5	59.50	14.88
I_4	14.0	13.4	13.5	14.1	55.00	13.75

Analysis of variance

Source of variation	Degrees of freedom	Sum of squares	Mean square	Computed F	TABULAR F 0.05	TABULAR F 0.01
Replication	3	3.165	1.055			
Factor A	3	121.515	40.505	77.23**	3.86	6.99
Error	9	4.720	0.524			
Total	15	129.400				

** = Highly significant

Coefficient of variation = 4.30%

Appendix Table 5. Non-marketable yield (kg/plot)

TREATMENT	REPLICATION I	II	III	IV	TOTAL	MEAN
I_1	1.0	0.8	0.7	0.7	3.20	0.80
I_2	0.5	0.7	1.0	1.2	3.40	0.85
I_3	1.0	1.0	1.3	1.0	4.30	1.08
I_4	1.0	1.0	1.2	1.1	4.30	1.08

Analysis of variance

Source of variation	Degrees of freedom	Sum of squares	Mean square	Computed F	TABULAR F 0.05	0.01
Replication	3	0.095	0.032			
Factor A	3	0.255	0.085	2.19ns	3.86	6.99
Error	9	0.350	0.039			
Total	15	0.700				

ns = Not significant

Coefficient of variation = 20.76%

Appendix Table 6. Average weight of the plants (g)

TREATMENT	REPLICATION I	II	III	IV	TOTAL	MEAN
I_1	303.0	272.0	275.0	305.0	1155.0	288.75
I_2	243.0	244.0	264.0	247.0	998.0	249.50
I_3	222.0	208.0	226.0	229.0	885.0	221.25
I_4	208.0	200.0	204.0	211.0	823.0	205.75

Analysis of variance

Source of variation	Degrees of freedom	Sum of squares	Mean square	Computed F	TABULAR F 0.05	TABULAR F 0.01
Replication	3	636.688	212.229			
Factor A	3	15938.188	5312.729	52.17**	3.86	6.99
Error	9	916.563	101.840			
Total	15	17491.438				

** = Highly significant

Coefficient of variation = 4.18%

Appendix Table 7. Total yield (kg/plot)

TREATMENT	REPLICATION				TOTAL	MEAN
	I	II	III	IV		
I_1	22.8	20.4	20.5	22.7	86.40	21.60
I_2	18.0	18.3	20.0	19.0	75.30	18.83
I_3	16.0	15.0	16.3	16.5	63.80	15.95
I_4	15.0	14.4	14.7	15.2	59.30	14.83

Analysis of variance

Source of variation	Degrees of freedom	Sum of squares	Mean square	Computed F	TABULAR F 0.05	TABULAR F 0.01
Replication	3	3.725	1.242			
Factor A	3	111.055	37.018	59.07**	3.86	6.99
Error	9	5.640	0.627			
Total	15	120.420				

** = Highly significant

Coefficient of variation = 4.45%

Appendix Table 8. Computed yield (t/ha)

TREATMENT	REPLICATION				TOTAL	MEAN
	I	II	III	IV		
I_1	43.6	39.2	39.6	44.0	166.40	41.60
I_2	35.0	35.2	38.0	35.6	143.80	35.95
I_3	30.0	28.0	30.0	31.0	119.00	29.75
I_4	28.0	26.8	27.0	28.2	110.00	27.50

Analysis of variance

Source of variation	Degrees of freedom	Sum of squares	Mean square	Computed F	TABULAR F 0.05	TABULAR F 0.01
Replication	3	12.660	4.220			
Factor A	3	486.060	162.020	77.23**	3.86	6.99
Error	9	18.880	2.098			
Total	15	517.600				

** = Highly significant

Coefficient of variation = 4.30%

Appendix Table 9. Soil moisture content (%)

TREATMENT	REPLICATION				TOTAL	MEAN
	I	II	III	IV		
I_1	37.48	31.50	31.80	29.34	130.12	32.53
I_2	33.86	34.76	31.55	29.26	129.43	32.36
I_3	37.06	31.89	31.17	30.76	130.88	32.72
I_4	32.97	32.48	31.46	30.20	127.11	31.78

Analysis of variance

Source of variation	Degrees of freedom	Sum of squares	Mean square	Computed F	TABULAR F	
					0.05	0.01
Replication	3	63.329	21.110			
Factor A	3	1.988	0.663	0.28ns	3.86	6.99
Error	9	21.493	2.388			
Total	15	86.810				

ns = Not significant

Coefficient of variation = 9.62%