

BIBLIOGRAPHY

MARIANO, LOIDA O. APRIL 2013. Performance of Spoon Cabbage (*Brassica chinensis* L.) as Affected by Different Concentration of Azolla Tea. Benguet State University, La Trinidad, Benguet.

Adviser: Darwin A. Basquial, MSc.

ABSTRACT

This study was conducted at the Pomology Experimental Area, Benguet State University, La Trinidad, Benguet from December 2012 to February 2013 to evaluate the effect of different concentrations and to recommend the best concentrations of azolla tea on the growth and yield of spoon cabbage and economics of its usage on the crop.

Results showed that different concentrations of azolla tea had no marked effect on the performance of spoon cabbage in terms of leaf length, average weight and total yield. In terms of return on investment, application of 14-14-14 and urea at a rate of 358g and 22g, respectively, per 5m²plot produced the highest return on investment at 199.87% or PhP 2.00 for every peso invested in the production with the selling price of PhP 100.00 per kilogram after harvesting.

Based on the results of the study, the farmers' practice of applying 358 g 14-14-14 plus 22 g urea per 5m² plot for spoon cabbage is still recommended.



RESULTS AND DISCUSSIONS

Leaf Length

The leaf length of spoon cabbage is presented in table 1. There were no significant differences in leaf length among the spoon cabbage applied with the different treatments. However, the plants applied with 358g 14-14-14 + 22g urea/m² had longer leaves while plants applied with pure azolla tea had shorter leaves.

Table 1. Leaf length (cm) of spoon cabbage as affected by different concentrations of azolla tea

CONCENTRATION OF AZOLLA TEA (%)	MEAN (cm)
Water only	20.42
Farmers' practice (358g 14-14-14 + 22g urea/m ²)	21.89
25%	20.69
50%	20.60
75%	21.64
100%	20.04

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

Number of Fully Expanded Leaves

Table 2 shows that there were no significant differences in the number of fully expanded leaves as affected by the different fertilizer treatments. However, the plants applied with 358g 14-14-14 +22g/m² urea had higher number of fully expanded leaves while plants with no fertilizer had the lower number of fully expanded leaves.



Table 2. Number of fully expanded leaves of spoon cabbage as affected by different concentrations of azolla tea

CONCENTRATION OF AZOLLA TEA (%)	MEAN
Water only	7.33
Farmers' practice (358g 14-14-14 + 22g urea/m ²)	9.00
25%	8.07
50%	8.30
75%	8.00
100%	8.20

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

Average Weight

Statistical analysis shows no significant differences in the average weight of individual plant. However, plants applied with 358g 14-14-14 plus 22g urea/m² had the heaviest bunch. On the other hand, plants applied with 100% azolla tea (pure). The application of azolla tea at different concentrations did not enhanced heavier weight of individual plant.

Total, Marketable, Non-marketable and Computed Yield

Table 4 shows that there were no significant differences in the total, marketable, non-marketable and computed yield per plot from the different treatments studied. However, the spoon cabbage plants applied with pure azolla tea had the lowest total, marketable, non-marketable and computed yield per plot while those applied with farmers' practice had the highest total, marketable, non-marketable and computed yield per plot.



Table 3. Average weight (g/bunch) of spoon cabbage as affected by different concentrations of azolla tea concentrations of azolla tea

CONCENTRATION OF AZOLLA TEA (%)	MEAN (g/bunch)
Water only	80.39
Farmers' practice (358g 14-14-14 + 22g urea/m ²)	99.87
25%	83.54
50%	93.56
75%	86.67
100%	79.68

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

Table 4. Total, marketable, non-marketable and computed yield of spoon cabbage as affected by different concentrations of azolla tea

CONCENTRATION OF AZOLLA TEA (%)	TOTAL	YIELD (kg/1 x 5m plot)		COMPUTED (t/ha)
		MARKETABLE	NONMARKETABLE YIELD	
Water only	10.50	9.25	1.25	21.00
Farmer's practice	11.85	10.60	1.25	23.83
25	10.45	9.05	1.40	20.90
50%	11.32	9.00	2.32	22.43
75%	10.72	9.32	1.40	21.4
100%	9.72	8.77	0.95	19.43

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



Severity of Insect Pest and Disease Infection

As shown in Table 5, there were no significant differences among the treatments. It appeared that 10-25% of the foliage of the plants treated with 25% azolla tea had the highest percentage of flea beetle infestation. On the other hand, plants treated with 358g 14-14-14 plus 22g urea had the lowest percentage wherein less 10-25% of the foliage was infested by cutworm and infected by alternaria leaf spot.

Initial and Final Soil Analysis

Table 6 shows the soil pH, organic matter, potassium and phosphorus of the experimental area before planting.

Table 5. Severity of insect pest and disease infection of spoon cabbage as affected by different concentrations of azolla tea

CONCENTRATION OF AZOLLA TEA (%)	FLEA BEETLE INFESTATION	CUTWORM INFESTATION	ALTERNARIA LEAF SPOT INFECTION
Water only	2.67	2.00	2.00
Farmer's practice	2.33	1.67	1.67
25%	3.33	2.00	2.00
50%	3.00	2.00	2.33
75%	2.67	2.00	2.33
100%	2.33	2.00	2.33

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

Rating Scale:

- 1 No pest
- 2 Less than 10% of the foliage affected
- 3 10-25% of the foliage affected
- 4 26-50% of the foliage affected
- 5 51-75% of the foliage affected
- 6 76% and above of the foliage affected



Table 6. Soil Analysis of the experimental area before planting and after harvesting the Spoon cabbage as affected by the different concentrations of azolla tea by the Department of Agriculture, Baguio Soils Laboratory

	SOIL pH	Organic matter (%)	Phosphorus (P,ppm)	Potassium (K,ppm)
Before planting	5.90	2.0	88	426
After harvesting	6.81	2.0	142	480

Return on Investment

As shown in Table 7, the highest return on investment (ROI) was derived from spoon cabbage production applied 358 g 14-14-14 plus 22 g urea per 5m² plot or PhP 2.00 for every peso invested in the production with the selling price of PhP 100.00. The lowest ROI was noted from spoon cabbage production applied with 100% azolla tea at 145.45%.

Table 7. Return on Investment of Spoon Cabbage as affected by different concentrations of azolla tea

Items	T1	T2	T3
T4	T5	T6	
Marketable yield (1 x 5 m plot)	27.75	31.8	27.15
27.0	27.95	26.30	

Farm inputs:

1. Seed cost	17.47	17.47	17.47
17.47	17.47	17.47	
2. Seedling tray	260.0	260.0	260.0
260.0	260.0	260.0	
3. Potting mix	21.67	21.67	21.67
26.67	26.67	26.67	
4. Fertilizers:			
a) Urea	-	9.9	-
-	-	-	



b) 14-14-14	-	-	9.24	-
-	-	-	-	-
c) Chicken dung	-	-	-	-
-	-	-	-	-
5. Organicide (mukosako)	2.61	2.61	2.61	2.61
2.61	2.61	2.61		
6. Others:				
a) muscuvado	-	-	-	22.25
22.25	22.25	22.25		
b) drum	116.92	116.92	116.92	116.92
116.92	116.92	116.92		
Farm Labor				
1. Land preparation	125.0	125.0	125.0	125.0
125.0	125.0	125.0		
2. Media preparation on trays	1.56	1.56	1.56	1.56
1.56	1.56	1.56		
3. Planting of seeds on trays	3.47	3.47	3.47	3.47
3.47	3.47	3.47		
4. Seedling transplanting	21.17	21.17	21.17	21.17
21.17	21.17	21.17		
5. Irrigation for seedling	2.92	2.92	2.92	2.92
2.92	2.92	2.92		
6. Irrigation	4.56	4.56	4.56	4.56
4.56	4.56	4.56		
7. Weeding	78.13	78.13	78.13	78.13
78.13	78.13	78.13		
8. Hilling-up	41.67	41.67	41.67	14.67
41.67	41.67	41.67		
9. Azolla application	-	-	-	23.44
23.44	23.44	23.44		
10. Organicide application	129.65	129.65	129.65	129.65
129.65	129.65	129.65		
11. Harvesting	140.63	140.63	140.63	140.63
140.63	140.63	140.63		
Gross income	2700.00	2795.00	2630.00	
2700.00	2795.00	2630.00	3180.00	2715.00
Total expenses	1072.22	1073.17	1071.52	
1072.22	1073.17	1071.52	1060.47	1072.37



Net Income		1752.72	2119.53	1642.63
1627.78	1721.83	1558.48		
ROI (%)		171.45	199.87	153.18
151.81	160.44	145.45		
Rank		2	1	4
5	3	6		

Note: Selling price is PhP 100.00 per kilogram.

Legend:

T1-Water only

T2- 358g 14-14-14 + 22g urea/m²

T3- 25% azolla tea

T4-50% azolla tea

T5-75% azolla tea

T6-100% azolla tea



SUMMARY, CONCLUSION AND RECOMMENDATION

Summary

The study was conducted at the Pomology Experimental Area, Benguet State University from December 2012 to February 2013 to evaluate the performance of spoon cabbage as affected by different concentrations of azolla tea; recommend the best concentrations of azolla tea on the growth and yield of spoon cabbage; and determine the cost and return analysis of using azolla tea in spoon cabbage production.

Results revealed no significant effect on the different concentrations of azolla tea in spoon cabbage production.

Conclusions

Based from the results of the study, application of the different concentrations of azolla tea does not have marked effects on the performance of spoon cabbage. On the other hand, application of 14-14-14 and urea at a rate of 358g and 22g, respectively, per 5m² plot will produce a return on investment at 199.87%.

Recommendation

Based from the above findings, the farmers' practice of applying 358g 14-14-14 plus 22g urea per 5m² plot for spoon cabbage is recommended, since it produced the highest return on investment.



LITERATURE CITED

- ANONYMOUS, 2007. Pakchoi. Retrieved July 18, 2007 from <http://www.cornellcea.com/pakchoiHandbook/pu-reference.htm>.
- BALAOING, J. G. 2011. Fermentation of azolla. Personal Interview.
- BASQUIAL, D. A. 2010. Performance of Hydroponically Grown Honeydew Melon (*Cucumis melo* L.) as affected by Nutrition and Shoot Pruning. MS Thesis. BSU, La Trinidad, Benguet. P. 20.
- DOUBRAVA, C. M. 2000. Pakchoi. Fall Volume: Issue: 7(3).
- KHAN, M. M. 1983. A Primer on Azolla Production and Utilization in Agriculture, 2nd ed. University of the Philippines at Los Banos (UPLB), PCARRD and SEARCA, Pp. 32, 34, 96-98, 116, 103.
- KHAN, M. M. 1988. Azolla Agronomy. College of Laguna, Philippines. P. 105.
- KINOSHITA, K. 1972. Vegetable Production on Sub-Tropics and Tropics. Tokyo, Japan: Lippincott, Inc. Pp. 146-148.
- LASUNA, J. C. 2006. Growth and Yield Response of Spoon Cabbage (*Brassica chinensis* L.) to Planting Distance. BS Thesis. BSU, La Trinidad, Benguet. p.16.
- LUMPKIN, T. A. and D. L. PLUCKNETT. 1986. Azolla as a Green Manure: Use and Management in Crop Production, Series No. 5. United States of America. Westview Press, Inc. Pp. 112-113.
- McDONALD, E. 1993. The American Horticultural Society Encyclopedia of Gardening. USA: Dorling Kindersley, Inc. P. 320.
- MFCL, NGMC and NARI. 2004. Cabbage Postharvest Care and Market Preparation, Technical Bulletin No. 25. Mon Repos, East Coast Demerara, Guyana. P.3.
- QUEBRAL, F.C. 1989. Azolla: Its Culture, Management and Utilization in the Philippines. National Azolla Action Program. University of the Philippines at Los Banos (UPLB). Pp. 1, 3, 4.
- TAMAYO, D. B. 1975. RP'S Top Favorite Vegetable. Quezon City Forest and Farms 8:6, 145.
- THOMPSON, H. C. 1931. Vegetable Crop. New York: McGraw Hill Book Inc. Pp. 143



145.

TINDALL, H. D. 1983. Vegetable in the Tropics MAC MILLAN EDUCATION LTD. Hound mills, Basingstoke, Hampshire RG21 2xs and London Companies and Representatives throughout the World.P. 111.

TITUS, A. and G. N. PEREIRA. 2010. Azolla as a Biofertilizer in Coffee Plantations. Retrieved August, 2010 from <http://www.ineedcoffee.com/06/azolla/>.

WESTERN SARE. 2010. Sustainable and Organic Agriculture Program. University of Hawaii – College of Tropical Agriculture and Human Resources. Retrieved August, 2010 from <http://www.ctahr.hawaii.edu/sustainag/cc-gm/azolla.html>.

