BIBLIOGRAPHY

PILPILING, JEYSFER E. March 2013. Performance of Chinese cabbage cv. Vigor 60 Established from Selected Seedling Production Methods. Benguet State University, La Trinidad, Benguet.

Adviser: Darwin A. Basquial, MSc.

ABSTRACT

Growth and yield response to various methods of seedling establishment of Chinese cabbage cv. Vigor 60 were evaluated in December 2011 to March 2012 at the Pomology experimental area, Benguet State University, La Trinidad, Benguet. Economic analysis of the crop was also done.

Chinese cabbage plants sown in polyethylene plastic bags were the earliest to form heads. Slightly firm heads were obtained in the seedlings that were grown in a seedbed as compared to those that were grown from different containers. Although Chinese cabbage sown in polyethylene plastic bag, directly planted and seeds sown in rolled banana leaves are comparable to each other. Chinese cabbage sown in polyethylene plastic bag produced the heaviest average head weight (0.75 kg), heaviest marketable yield (25.67 kg/5m^2), and total yield per plot (25.83 kg/5m^2) and the highest computed yield per hectare (51.33 t/ha).

Chinese cabbage seedlings established in polyethylene plastic bag obtained the highest return on cash expenses (ROCE) of 10.86 % or PhP 0.10 for every peso invested in the production with the selling price of PhP 7.00 per kilogram.

RESULTS AND DISCUSSION

Percentage Seedling Survival

Table 1 shows the percentage of seedling survival after transplanting. All of the seedlings survived after transplanting in the experimental area established from different seedling production methods.

Number of Days to Head Formation

Seedling established from polyethylene plastic bags and those that were directly planted were the earliest to initiate head at 40.67 and 41.67 days, respectively (Table 1). These results are comparable with the seedlings established from rolled banana leaves (42.67 days). Seedlings established from seedbed took the longest days to form heads at 41.67 days.

The results may be due to the differences in the sizes of holes of the different containers used in the study. The holes of seedling tray, chopped hose, and rolled banana leaves were smaller which accommodated less amount of soil mixture that limits the growth of the roots as compared to polyethylene plastic bags which accommodated more mixture of soil (compost garden soil and sand 1:1:1) that provides proper aeration, water and nutrient holding capacity (Bautista 1994). While longest time to initiate head formation ware observed from the seedlings established in seedbed due to the total root disturbance during the transplanting of the seedling.

Table 1. Percentage seedling survival and number of days to head formation of Chinese cabbage cv. Vigor 60 as affected by various methods of seedling establishment

SEEDLING ESTABLISHMENT METHOD	SURVIVAL (%)	DAYS TO HEAD FORMATION
Direct seeding	100[a]	41.67[a]
Seedbed method	100[a]	47.67[c]
Seedling tray	100[a]	45.33[bc]
Recycled chopped hose	100[a]	45.33[bc]
Rolled banana leaves	100[a]	42.67[ab]
Polyethylene plastic bag	100[a]	40.67[a]

Means in a column with the same letters are not significantly different at 5% level by DMRT

Head Firmness

Table 2 shows that slightly firm heads were obtained in seedlings established in seedbeds as compared to those that were established from different containers.

This result implies that transplanting greatly delay the formation of heads that contributes to the compactness of heads which confirms the report of Balliyao (1977). Balliyao further explained that transplanted seedlings delay the overall growth of the plants as it took time for the foliage and roots to regenerate.

Table 2. Head firmness and Percentage heading of Chinese cabbage cv. Vigor 60 as affected by various methods of seedling establishment

SEEDLING ESTABLISMENT METHOD	HEAD FIRMNESS	PERCENTAGE HEADING (%)
Direct seeding	firm	90.13[c]
Seedbed method	slightly firm	97.04[b]
Seedling tray	firm	98.66[a]
Recycled chopped hose	firm	98.77[a]
Rolled banana leaves	firm	98.66[a]
Polyethylene plastic bag	firm	98.88[a]

Means in a column with the same letters are not significantly different at 5% level by DMRT

Percentage Heading

Seedlings established from polyethylene plastic bags, recycled chopped hose, rolled banana leaves and seedling tray successfully produced heads reflected by the increased percentage heading averaging 98.74 percent, as compared to seedbed method and direct seeding at 97.04 pecent and 90.13, respectively (Table 2).

The significantly lower percentage heading of directly seeded from those that transplanted seedlings are due to the unselected seeds during the time of planting. It was also reported by Hartman and Kester (1967) that there are many problems that must be overcome to provide proper environmental conditions for good uniform germination and for optimum development of the crop.

Table 3. Head equatorial and polar diameter of Chinese cabbage cv. Vigor 60 as affected by various methods of seedling establishment

SEEDLING ESTABLISMENT METHOD	DIAMETER (cm)	
	EQUATORIAL	POLAR
Direct seeding	11.41[a]	27.40[a]
Seedbed method	9.77[a]	27.13[a]
Seedling tray	9.99[a]	26.97[a]
Recycled chopped hose	9.52[a]	25.03[a]
Rolled banana leaves	10.54[a]	28.00[a]
Polyethylene plastic bag	11.28[a]	28.57[a]

Means in a column with the same letters are not significantly different at 5% level by DMRT

Head Equatorial and Polar Diameter

Directly seeded Chinese cabbage produced the widest equatorial diameter (11.41 cm) while seedlings established in rolled banana leaves produced the longest heads (28 cm) as shown in Table 3. However, no significant differences were observed among the treatments.

Average Head Weight

As shown in Table 4, seedlings established in polyethylene plastic bag produced the heaviest heads with an average weight of 0.75 kg which is comparable to the seedlings established in rolled banana leaves (0.69 kg), and those that were directly seeded (0.66 kg).

Table 4.Average head weight of Chinese cabbage cv. Vigor 60 as affected by various methods of seedling establishment

SEEDLING ESTABLISMENT METHOD	AVERAGE HEAD WEIGTH (Kg)
Direct seeding	0.66[abc]
Seedbed method	0.55[c]
Seedling tray	0.60[bc]
Recycled chopped hose	0.60[bc]
Rolled banana leaves	0.69[ab]
Polyethylene plastic bag	0.75[a]

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

It is clear in this results that the difference in diameter, length, and firmness of the Chinese cabbage heads contributes to the average weight of the individual heads.

Weight of Marketable and Non-marketable Heads per plot

Seedlings established in polyethylene plastic bag had the heaviest marketable heads per plot at 25.67 kg per plot. However, the results are comparable to the marketable heads from the seedling established from rolled banana leaves (23.67 kg) and those that were directly seeded (22 kg). No significant differences were observed on the non-marketable weight of Chinese cabbage as affected by the different seedling establishment methods.

Table 5. Weight of marketable and non-marketable heads per plot of Chinese cabbage cv. Vigor 60 as affected by various methods of seedling establishment

SEEDLING ESTABLISMENT METHOD	MARKETABLE (kg)	NON-MARKETABLE (kg)
Direct seeding	22.00[abc]	0.58[a]
Seedbed method	18.68[c]	0.32[a]
Seedling tray	20.67[bc]	0.00[a]
Recycled chopped hose	20.33[bc]	0.17[a]
Rolled banana leaves	23.67[ab]	0.00[a]
Polyethylene plastic bag	25.67[a]	0.17[a]

Means in a column with the same letters are not significantly different at 5% level by DMRT

Total Yield per Plot

Chinese cabbage established from polyethylene plastic bag significantly outyielded the other treatments with a mean of 25.83 kg. Seedlings established in seedbed produced the least yield at 19 kg.

It is clear in this result that the higher percentage heading, longer polar diameter, head firmness and heavier average head weight contributes to the high marketable yield of seedlings established in Polyethylene plastic.

Table 6.Total yield per plot and Computed yield tons per hectare of Chinese cabbage cv. Vigor 60 as affected by various methods of seedling establishment

SEEDLING ESTABLISMENT METHOD	TOTAL YIELD (kg)	COMPUTED YIELD (t/ha)
Direct seeding	22.58^{bc}	44.00^{abc}
Seedbed method	19.00^{bc}	37.33^{c}
Seedling tray	20.67^{c}	41.33^{bc}
Recycled chopped hose	20.05^{c}	40.67^{bc}
Rolled banana leaves	23.67^{b}	47.33^{ab}
Polyethylene plastic bag	25.83^{a}	51.33^{a}

Means in a column with the same letters are not significantly different at 5% level by DMRT

Figure 3.Sample Chinese cabbage headsharvested from directly seeded (T_1), seedlings established from seedbed (T_2), seedlings established in seedling tray (T_3), seedlings established in recycle chopped hose (T_4) seedlings established in rolled banana leaves (T_5) and seedlings established in polyethylene plastic bag (T_6)

Computed Yield (t/ha)

The computed yield per hectare indicated that Chinese cabbage seeds established in polyethylene plastic bag produced the highest yield at 51.33 tons per hectare (Table 6). However, the results are comparable to the computed yield from seedlings established from rolled banana leaves 47.33 tons and those that were directly seeded 44 tons per hectare. While seedlings established from seedbed had the lowest yield at 37.33 tons per hectare.

Cost and Return Analysis

Table 7 shows the cost and return analysis of the different treatments used in the study. As shown in the table, different total marketable yield and levels of expenses resulted to varying net profit and return on the cash expenses. Seedlings established in polyethylene plastic bag obtained the highest return on cash expenses (ROCE) of 10.86 % or PhP 0.10 for every peso invested in the production with the selling price of PhP 7.00 per kilogram after harvesting. This was followed by seedlings established in rolled banana leaves, directly seeded, seedlings established in recycled chopped hose and seedlings established in seedling tray with 2.22%, -7.18%, -12.17%, and -12.74%, respectively. The lowest return on cash expenses of -18.34% was obtained from seedlings established in seedbed.

Table 7. Cost and Return Analysis of the different treatments in 15 sq. m plot of Chinese cabbage cv. Vigor 60 as affected by various methods of seedling establishment

ITEMS	TREATMENT					
	T_1	T_2	T_3	T_4	T_5	T_6
Yield (kg)	66.00	56.00	62.00	61.00	71.00	77.00
Sales (PhP)	462.00	392.00	434.00	427.00	497.00	593.00
Expenses						
Inputs:						
1. Seeds	22.33	10.73	10.73	10.73	10.73	10.73
2. Pesticides						
a. Sumicidin	41.00	41.00	41.00	41.00	41.00	41.00
b. Seven	16.00	16.00	16.00	16.00	16.00	16.00
3. Fertilizer						
a. Chicken dung	36.66	36.66	36.66	36.66	36.66	36.66
b. Complete fertilizer (14-14-14)	87.66	87.66	87.66	87.66	87.66	87.66
4. Tray			11.25			
5. Polyethylene bag						8.00
Labor cost (PhP.)						
6. Land preparation	43.33	43.33	43.33	43.33	43.33	43.33
7. Planting	20.83	20.83	20.83	20.83	20.83	20.83
8. Transplanting	41.66	41.66	41.66	41.66	41.66	41.66
9. Irrigation	104.16	104.16	104.16	104.16	104.16	104.16
10. Hilling-up	41.66	41.66	41.66	41.66	45.66	45.66
11. Harvesting	25.00	25.00	25.00	25.00	25.00	25.00
12. Marketing	17.50	17.50	17.50	17.50	17.50	17.50
Total expenses (PhP)	497.79	486.19	497.44	486.19	486.19	494.19
Net income (PhP)	462.00	392.00	434.00	427.00	497.00	593.00
ROCE (%)	-7.18	-18.34	-12.74	-12.17	2.22	10.86
RANK	3	6	5	4	2	1

Note: The selling price during the harvest is PhP 7.00/kg
Area $90m^2$=612 plants

Legend
T_1-direct seeding
T_2-seedbed method
T_3-sowing seed in seedling tray
T_4-sowing seed in rolled banana leaves
T_5-sowing seed in recycle chopped hose (1x1.5 inches)
T_6-sowing seed in polyethylene plastic bags (2x3 inches)

SUMMARY, CONCLUSION AND RECOMMENDATION

Summary

The study was conducted at the pomology experimental area, Benguet State University, La Trinidad Benguet from December 2011 to March 2012 to evaluate the performance of Chinese cabbage established from selected seedling production methods, determine the best method of seedling establishment that will enhance optimum yield and to determine the economics of using different seedling production methods in Chinese cabbage production.

Chinese cabbage established from polyethylene plastic bag and those that were directly seeded were the earliest to initiate head. In head firmness; slightly firm heads was obtained in the seedlings that were established in seedbed as compared to those that established from different containers. Chinese cabbage established from polyethylene plastic bag produced the longest polar diameter (28.87 cm), the heaviest average head weight (0.75 kg), the heaviest marketable yield (25.67 kg) and total yield (25.83 kg) and the highest computed yield per hectare (51.33 t/ha).

In terms of profitability, Seedlings established in polyethylene plastic bag obtained the highest return on cash expenses (ROCE) of 10.86 % or PhP 0.10 for every peso invested in the production with the selling price of PhP 7.00 per kilogram. This was followed by seedlings established in rolled banana leaves, directly seeded, seedlings established in recycled chopped hose and seedbed tray with 2.22%, -7.18, -12.17%, and 12.74% respectively. The lowest return on cash expenses of -18.34% was obtained from seedlings established in seedbed.

Conclusion

Based on the results presented and discussed, it was observed that Chinese cabbage seedlings established in polyethylene plastic bag produced higher yield and had the highest return on cash expenses (ROCE).

Recommendation

It is therefore recommended that establishing seedlings in polyethylene plastic bag is the best method of establishing Chinese cabbage to obtain higher yield and profit.

LITERATURE CITED

BALIYAO, C. 1979. The effect of direct seeding pricked and unpricked on the growth and yield of lettuce, BS thesis (Unpub.) BSU, La Trinidad,Benguet. P.29.

BAUTISTA and MABESA 1977, Vegetable production.University of the Philippines. College of Agriculture, Los Baños, Laguna Pp. 129,560.

BAUTISTA O.K. et al, 1994. Introduction to tropical horticulture. 2nd Ed. Regional Center for Graduate Study and Research in Agriculture (SEAMAEO SEARCA) and University of the Philippines Los Baños (UPLB). Pp. 177-178.

DULAGAN G. B. 1983. The effect of age of transplanting and direct planting on the growth and yield of lettuce.BS thesis (Unpub.) BSU, La Trinidad,Benguet. Pp 1-2.

GEORE W. Ware and J.P. McCollum 1980.Producing Vegetable Crops.3rd Ed.The Interstate Printers and Publisher Inc. Danville Illinois.P.113.

GUTIERREZ C. A. 2000. Cost of producing cabbage seedlings from different methods of establishment, BS thesis (Unpub.) BSU, La Trinidad,Benguet.

HARTMAN H.T. and KESTER. 1967. Plant propagation. 2nd Ed. Prentice-Hall International Corporation, New Delhi. Pp.50-54.

KINOSHITA, K. L. 1972. Vegetable production in the subtropics and tropics. Tokyo, Japan Overseas Crop Agency.Pp 122,674-675.

KNOTT, J.E. 1951. Vegetable Growing.2nd Ed. Philadelphia, Lea and Fiber.P.84.

PUNDO, J.L.1984. The effect seedling hardening on the growth and heading of Chinese cabbage. (Unpub.) BS thesis. BSU, La Trinidad, Benguet. P.29.

SACYABEN, E.E. 1981. Chemical control of cercospora leaf spot of pechay.BS thesis (Unpub.). BSU, La Trinidad, Benguet. P.25.

SAHADEVAN. N. 1987. Green Fingers: Total commitment to the development of farming. Malaysia, Sahadevan Pub. Co. P.73.

THOMPSON, H.C. 1954. Vegetable crops. 5th Ed. Tata: Mc Grow-Hill International Corporation, New Delhi. Pp. 315-317.

VILLAREAL, R.L. and P.H. WALLACE. 1969. Vegetable Training Manual. UPLB, Los Baños