BIBLIOGRAPHY

TIÑAS, REY A. APRIL 2012. Varietal Resistance of Chinese Cabbage (*Brassica pekinensis*Hort)to Flea Beetle (*PhyllotretaStriolata*Pokorney*)*. Benguet State University, La Trinidad, Benguet.

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ABSTRACT

The study was conducted at Benguet State University Experimental Area in Balili, La Trinidad, Benguet from November 2011 to February 2012 to determined the population of flea beetle on the Chinese cabbage; to record the injury inflicted by the flea beetle on the Chinese cabbage; to determine the yield of Chinese cabbage and to compute the Return On Invesment (ROI) of each variety of Chinese cabbage.

Variety Michihili had the highest population of flea beetle adult; high on varieties Cr Chesney, S & G, Summerstar and low population of adult flea beetle on varieties Green Cool and Loo Green.

The injury of adult flea beetle had similar new feeding holes on the leaves of all varieties of Chinese cabbage used. There were less plants per hill that was injured by the larval flea beetle in the variety Michihili of 26.55%. The S & G variety had the highest number of plant per hill injured by the flea beetle larvae of 47.65%.

Michihili variety had the highest marketable & less non-marketable heads of Chinese cabbage.

Variety Michihili had the highest Return on Investment (ROI) of 74.2%.

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INTRODUCTION

Chinese cabbage (*Brassica pekinensis*Hort), one of the most major crops grown in the Philippines is most adapted to Benguet and around Cordillera region and most common leafy vegetables sold in our local markets. It is also known as one of the oldest vegetables in Asia. The different varieties of Chinese cabbage contains high vitamins and minerals, in fact some vegetables have higher vitamin C than the best source of fruits. This vegetable contains most food nutrients. They are particular rich in minerals and vitamins.

Flea beetle is the common name to an insect of the family chrysomilidaeand the order of the coleopteran. Flea beetles are one of the most difficult to manage pest of cruciferous crops. There are various genera and species of flea beetles, all members of the chrysomilidae family. They occasionally damage vegetables, flowers, and even trees. Adult's flea beetle, which produce most plant injuries are typically small often shiny, and have larger rear legs that allow them to jump like a flea when disturbed. And also produce characteristics injury known as 'shot holing". The adults chew many small holes or pits in the leaves, which make them look as if they have been damage by fine buckshot. Young plants and seedlings are particularly susceptible. Growth may be retarded and even kill. Leaf feeding also of plant appearance. Further damage may be done by the larvae, which feed on the roots. Some flea beetles are considered general feeders, though many species attack only one plant or closely related kinds of plants (Metcalf and Metcalf, 1995).

The findings of the study will guide and provide important information to all vegetable grower in which of the varieties of Chinese cabbage will be having good yield and more immuned to a flea beetle. Furthermore it will help the vegetables grower to lesser their farm input.

The studies aimed were to determine the population of flea beetle on the chinese cabbage leaves, to monitor the injury inflicted by the flea beetle on the leaf of Chinese cabbage and to determine the yield of the chinese cabbage.

The studies were conducted at Benguet State University Experimental Area in Balili, La Trinidad, Benguet from November 2011 to February 2012.

REVIEW OF LITERATURE

Varietal Evaluation

Bautista and Mabesa (1997), selecting the right variety will minimize problems associated with water and fertilizer management. The variety to be selected should be less input and ensure profit.

The findings of Bionde (1995), from his study on varietal resistance showed that turnips, mustards and Chinese cabbage were more resistant vegetables to insect pest. Cadiz (1990) found that most variety of Chinese cabbage imported from Hongkong, Taiwan, and Japan appear adapted to the Philippine conditions. They are adapted elevations in the cool and dry season.

Ecology and Description of Flea beetle

Adult flea beetle feed externally on plants, eating the surface of the leaves, stems and petals. Under heavy feeding the small round holes caused by an individual flea beetles feedings may coalesce into larger areas of damage. Some flea beetles are root feeders. In adverse weather conditions some flea beetles seek shelter in the soil. Some species, such as phyllotretacruciferae and striolata, prefer to leave their hide out only during jumping ability and this behavior of hiding in the soil (Whiting and Wilson, 2002).

Flea beetle is found in a wide variety of habits, forest as well as fields and prairies. In Hungary it is common of the leaf beetle assemblages in basswood and maple canopies, but only as visiting or “tourist” species (Vig and Mark, 2005).

Most of the present information on the biology flea beetle was compiled from European literature since the species has been little investigated in North America. In the

Europe, flea beetles over winters as adults which emerged at the end of March and the beginning of April when the temperature is 8-9 degrees Celsius. They search for appropriate host plants, and the feeding flea beetle is characterized by numerous small holes bordered by a narrow line of dead brown leaf (Jourdevil, 1993).

Levesque (2009) considered several flea beetle species as companion specie of grape pest into vineyards of the Eastern townships in Quebes, Canada since this flea beetle thriving on various weeds within the vineyards, but not on grape itself. It was the third most common leaf beetle species of the L" Orpailleur vineyard and the fourth at Dietrich- joss among the 59 species of the leaf beetle fauna in raspberry fields at John Ville in Southern Quebec where it was replaced by the native flea beetle.

Life Cycle of Flea Beetle

Flea beetles over winter as adults under soil and leaf litter in brushy or woody areas surrounding fields, rather than in grassy areas right next to fields. They emerge in early spring when temperatures reach about 50 degrees, feeding on weeds or crops, if available. Females soon lay their eggs in the soil at the base of these plants. Eggs hatch in a week or two and the larvae feed on plants until fully grown. Then they pupate in the soil for 11 to 13 days before emerging as adults. Delaying the planting dates of susceptible crops until after the over wintering beetles have emerged is one way to reduce damage to young plants (Whiting and Wilson, 2002).

Varietal Characteristics

Variety choice in organic farming is an essential factor of successful production. But there is significant lack of information on the performance of varieties under organic

conditions. As conventional plant breeding aims at optimizing yields under high input conditions. As diversity of organic farming system and condition is large and results in a larger genotype-environment-management interaction than in conventional Agriculture, the organic farmers is more interested in varieties, that have the ability to adapt to variable conditions and performed well with stable yields in different years at the specific site. In many countries there are variety trials under organic conditions but not for every crop and every year. Some are conducted by farmers groups, others research station or by chemical seed companies. In the organic sector, the non-chemical approach also has effects on traits concerning product quality such as long term storability without sprouting inhibitors for cabbage and potatoes (Lammerts Van Buere*net al*., 2004).

MATERIALS AND METHODOLOGY

Materials

The materials used were digital camera, gasoline, tractors, grab hoe, compost, watering can, sunflower leaves, papers, gypsum, foliar, record book and seeds of Chinese cabbage.

Land Preparation

The provide 24 plots area was cleaned by the used of grab hoe, then after cleaning the cleaned area were cultivated by the used of hand tractor. The plots measured 1m x 10m each. Chinese cabbage seeds were planted in double rows at a distance of 25cm x25cm rows. The Chinese cabbage seed that planted were bought from the La Trinidad, Benguet Farm Supply. Prior to planting, the soil was fertilized with compost and gypsum lime. The plants were irrigated manually every other day. Application of fermented sunflower leaves and foliar fertilizer as spray was done one week after plant emergence to help for the growth of the plant.

Fertilization

The gathered sunflower leaves from Benguet State University garden was chop with the used of bolo and was put on the drum and add with water until it was full and covered with plastic for fermentation to 4-5 days. The fermented leaves was mixed with water (10 ml/L of water) and watered on the plants with the use of watering can.

Monotoring the Population of
Flea beetle to Chinese Cabbage

In monitoring the population of flea beetle to chinese cabbage were taken weekly. There were ten plants that was taken per treatment at random as samples. The flea beetle were counted visually on the plant leaves and were recorded. Fleabeetle that just jump into the leaves during the counting were not included.

Monitoring the New Feeding Holes of Flea
beetle to Chinese Cabbage

The new feeding holes inflicted to chinese cabbage were taken weekly. There were ten plants that was taken per treatment at random as samples. Needing holes was counted visually on the outside leaves of the chinese cabbage. New feeding holes are typically small often shiny. The counted feeding holes were recorded.

Yield

Yield was gathered on the ten plants of chinese cabbage that was taken per treatment at random as samples. The chinese cabbage were harvested and were classified to marketable and non marketable. In marketable yield, the chinese cabbage were cut and removed the inflicted leaves and it was weighed (kg). After it was weighed and packed it was brought to the market. The chinese cabbage thatwas not bought and was returned were added into the non-marketable yield.

The six treatments laid in a Randomized Complete Block Design (RCBD) replicated four times.

The varieties were:

T_1-Michihili (Ramgo seeds)

T_2-Chinese cabbage F1 Hybrid Cr Chesney

T_3-S & G (Syngenta seeds)

T_4-Summers star

T_5-Green cool

T_6–Loo Greens (Hybrid Syngenta seeds)

Data Gathered were:

1. Population of the flea beetle. The total number of flea beetle counted from the leaves of Chinese cabbage.

2. Injury. The total number of injury inflicted by flea beetle on the plants.

   a).Larval injury.Total number of dead plants that was inflicted by the larvae.

   b). Adult injury.Total number of injury on the leaves.

3. Yield. Weight (kg) of Chinese cabbage after harvesting.

   a). Marketable yield (kg). Harvested Chinese cabbage that were presentable to the market.

   b). Non-marketable yield (kg). Harvested Chinese cabbage that were not presentable to the market.

   Documentation

Figure 1. Flea beetle larva

Figure 2. Adult Flea beetle

Figure 3. Chinese cabbage inflicted of flea beetle larvae

Figure 4.New feeding holes of adult flea beetle.

Figure 5.Weighing of marketable and non-marketable yield.

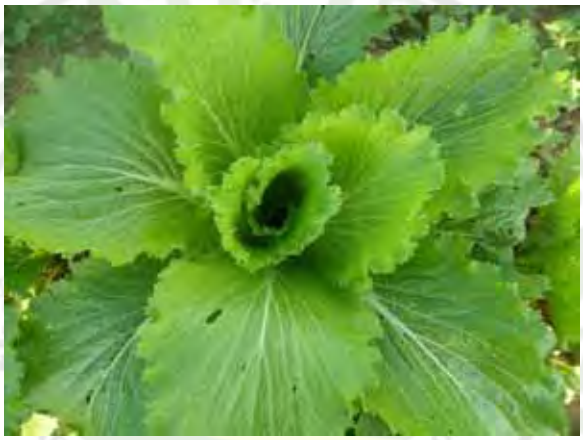

Figure 6.Michihili Variety

Figure 7. Cr Chesney Variety

Figure 8. S & G Variety

Figure 9.Summerstar Variety

Figure 10 Loo Green Variety

Figure 11. Green Cool Variety

RESULTS AND DISCUSSION

Adult Flea Beetle Population

As shown in Table 1, the total population of Michihili variety significantly differs from that of Green Cool and Loo Green, the mean weekly population per plant was highest in the Michihili variety with a mean (221.75) followed by Summerstar(213.33), S & G (197.45), Cr Chesney (194.98), Loo Green (191.35), the lowest is in Green Cool which was 186.

Population of flea beetle is highest in Michihili variety because of its characteristics that has a wide and elongated leaves than the other varieties.

Table 1. Averageweekly population of adult flea beetle on the different varieties of Chinese cabbage from November 2011 to February 2012

VARIETY	REPLICATION Total	Mean
Michihili	887	221.75[a]
CR Chesney	779.9	194.98[ab]
S & G	789.8	197.45[ab]
Summerstar	853.3	213.33[ab]
Green Cool	744	186.00[b]
Loo Green	765.4	191.35[b]
Mean	803.23	200.81

*Common letters are notsignificant different 5% level of significance (DMRT)

Percentage Injury of Adult Flea beetle

Table 2 shows that there is no significant different on the new feeding holes of flea beetle in each plant and in each variety. Among the six varieties, Michihili had the highest mean feeding holes (1089.15) followed by Green Cool (1049.13), Loo Green (1048.58), Cr Chesney (1044.68), Summerstar (1037.75), and the lowest is S & G with a total mean of 1005.73.

Michihili has a thin leaves were the flea beetle can easily consume on it.

Percentage Injury of Flea beetle larvae

Table 3 presents the percentage of larval injury per plot. The third variety, S & G, yielded the highest larval injury at 47.65 mean followed by Loo Green, Green cool, Cr Chesney, Summerstar, andMichihili with a mean of 42.18, 37.88, 36.32, 33.19 and 26.55 respectively.

Table 2. Meanweekly new feeding holes of adult flea beetle on the varieties of Chinese cabbage from November 2011 to February 2012

VARIETY	REPLICATION Total	Mean
Michihili	4,356.60	1,089.15[a]
CR Chesney	4,178.70	1,044.68[a]
S & G	4,022.90	1,005.73[a]
Summerstar	4,151.00	1,037.75[a]
Green Cool	4,196.50	1,049.13[a]
Loo Green	4,194.30	1,048.58[a]
Mean	4,183.33	1,045.83

*Common letters are not significant different 5% level of significance (DMRT)

Table 3. Percentage larval injury on the different varieties of Chinese cabbage from November 2011 to February 2012.

VARIETY	REPLICATION Total	Mean
Michihili	106.23	26.55[a]
CR Chesney	145.3	36.32[a]
S & G	190.61	47.65[a]
Summerstar	132.79	33.19[a]
Green Cool	151.55	37.88[a]
Loo Green	168.74	42.18[a]
Mean	149.20	37.30

*Common letters are not significant different 5% level of significance (DMRT)

Marketable Yield

The table shows no significant differences among the six varieties in terms of marketable yield. As gleaned from the table, Michihili yielded the highest with an average of 7.21kg followed by Summerstar with 5.14 kg, S & G with 4.35 kg, Green Cool with 4.06 kg, Loo green with 3.73. On the other hand, the lowest marketable yield is that of Cr Chesney 3.39 kg.

Yield is highest onMichihili were it produce many leaves and has good appearance.

Table 4. Mean marketable yield as inflicted flea beetle on the different varieties of Chinese cabbage from November 2011 to February 2012.

VARIETY	REPLICATION Total	Mean
Michihili	28.85	7.21 [a]
CR Chesney	13.55	3.39 [a]
S & g	17.4	4.35 [a]
Summerstar	20.55	5.14 [a]
Green Cool	15.9	4.06 [a]
Loo Green	14.9	3.73 [a]
Mean	18.52	4.40

*Common letters are not significant different 5% level of significance (DMRT)

Non-marketable Yield

Table 5 shows the data gathered on the non-marketable yield per plant. As gleaned from the table, Loo Green yielded the highest with an average of 2.45kg followed by CR Chesney with 2.0 kg, S & G with 1.5 kg, Michihili with O.75 kg, Green cool 0.67 respectively. On the other hand, the lowest non-marketable yield is that of Summerstar, 0.45 kg.

Table 5. Meannon-marketable yield as inflicted of flea beetle on the different varieties of Chinese cabbage from November 2011 to February 2012.

VARIETY	REPLICATION Total	Mean
Michihili	3	0.75 [a]
CR Chesney	8	2.00 [a]
S & G	6	1.50 [a]
Summerstar	1.8	0.45 [a]
Green Cool	2.7	0.67 [a]
Loo Green	9.8	2.45 [a]
Mean	5.22	1.30

*Common letters are not significant different 5% level of significance (DMRT)

Return on Investment

Table 6 shows the corresponding Return on Investment (ROI) per plot. The highest net income is from Michihili which was 310 followed by Summerstar of 308.25; the lowest was from CR Chesney of 203.25.

The corresponding ROI from Michihili was the highest (74.2) while that of Loo Green was the least (8.78). It is further observed that the one with highest ROI had the highest net income and the lowest expense.

Table 6. Average computed return on investment (ROI) on the different varieties of Chinese cabbage from November 2011 to February 2012.

VARIETY	Return on investment
Michihili	74.20 [a]
CR Chesney	12.72 [a]
S & G	24.02 [a]
Summerstar	59.84 [a]
Green Cool	26.46 [a]
Loo Green	8.78 [a]
Mean	34.37

*Common letters are not significant different 5% level of significance(DMRT)

SUMMARY, CONCLUSION AND RECOMMENDATION

Summary

The study was conducted at Benguet State University Experimental Area in Balili, La Trinidad, Benguet from November 2011 to February 2012 to determine varieties, which posses degree of resistance against flea beetle infestation, monitor the injury on the plant leaves and were correlate the population of flea beetle to the injury on leaves and yield of Chinese cabbage plant.

Among the six varieties of Chinese cabbage evaluated, the highest weekly feeding holes is Michihili with means of 1089.15 respectively respectively were resistant to flea beetle, conversely the other varieties Green Cool (1049.73), Loo Greens (1048.58), Cr Chesney (1044.68), Summerstar (1037.75), and Syngenta (1005.73).

The total marketable yield of Chinese cabbage were in the highest total for the variety of Michihili with a mean of 7.21, followed by the Summerstar (5.14), S & G (4.35), Green Cool (4.06), Loo Green (3.73) and Cr Chesney (3.39)

Conclusion

Therefore, Michihili variety has the highest population of flea beetle, highest in injury and highest in yield, were in the characteristics has wide elongated leaves and produce many leaves than the other variety.

Recommendation

Among the six varieties, Michihili are recommended to plant during months when beetle is high that it exhibited resistance to flea beetle. Furthermore, it was stated on the studies that it was the highest marketable yield and on return on investment. Although at

different growing season that all the varieties of Chinese cabbage could be planted by growers in the field but in terms of resistant plant, the MichihiliRamgo Seeds.

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APPENDIX

Table 1. Weekly Adult Flea Beetle Total Population per Plant

	BLOCKS					
TREATMENT	I	II	III	IV	Total	Mean
Michihili	217.8	223.3	218.4	227.5	887	221.75
CR Chesney	205.6	195.4	191	187.9	779.9	194.975
S & G	202.4	198	198.6	190.8	789.8	197.45
Summerstar	226.4	220.6	214.1	192.2	853.3	213.325
Green Cool	168.8	193.5	197.9	183.8	744	186
Loo Green	187.2	197.9	204.7	175.6	765.4	191.35
TOTAL	1208.2	1228.7	1224.7	1157.8	4819.4	1204.85
MEAN	201.37	204.78	204.12	192.97	803.23	200.81

ANOVA TABLE

SOURCE OF VARIATION	SUM OF SQUARES	DEGREE OF FREEDOM	MEAN SQUARE	COMPUTED F	$F_{0.05}$
BLOCKS	531.295	3	177.0983	1.849952	3.287382
TREATMENT	3797.093	5	759.4187	7.932812*	2.901295
Error	1435.97	15	95.73133		
Total	5764.358	23			

*significant

Table 2. Weekly New Feeding Holes of Flea Beetle per Plant

	BLOCKS					
TREATMENT	I	II	III	IV	Total	Mean
Michihili	1,050.20	1,114.80	1,074.50	1,117.10	4,356.60	1,089.15
CR Chesney	1,055.90	1,033.80	1,053.30	1,035.70	4,178.70	1,044.68
S & G	1,048.10	948.8	1,039.80	986.2	4,022.90	1,005.73
Summerstar	1,061.40	1,032.00	1,056.50	1,001.10	4,151.00	1,037.75
Green Cool	1,109.90	1,009.80	1,035.90	1,040.90	4,196.50	1,049.13
Loo Green	1,037.20	1,055.70	1,042.30	1,059.10	4,194.30	1,048.58
TOTAL	6,362.70	6,194.90	6,302.30	6,240.10	25,100.00	6,275.00
MEAN	1,060.45	1,032.48	1,050.38	1,040.02	4,183.33	1,045.83

ANOVA TABLE

SOURCE OF VARIATION	SUM OF SQUARES	DEGREE OF FREEDOM	MEAN SQUARE	COMPUTED F	$F_{0.05}$
BLOCKS	2678.433	3	892.8111	0.860119	3.287382
TREATMENT	14280.18	5	2856.037	2.751456^{ns}	2.901295
Error	15570.14	15	1038.009		
Total	32528.75	23			

^{ns}not significant

Table 3. Larval Injury per Plot (%)

	BLOCKS					
TREATMENT	I	II	III	IV	Total	Mean
Michihili	17.18	15.62	53.12	20.31	106.23	26.5575
CR Chesney	40.62	31.25	34.37	39.06	145.3	36.325
S & G	45.31	17.18	45.31	82.81	190.61	47.6525
Summerstar	53.12	29.68	28.12	21.87	132.79	33.1975
Green Cool	15.62	25	76.56	34.37	151.55	37.8875
Loo Green	39.06	75	17.18	37.5	168.74	42.185
TOTAL	210.91	193.73	254.66	235.92	895.22	223.805
MEAN	35.15	32.29	42.44	39.32	149.20	37.30

ANOVA TABLE

SOURCE OF VARIATION	SUM OF SQUARES	DEGREE OF FREEDOM	MEAN SQUARE	COMPUTED F	$F_{0.05}$
BLOCKS	361.5985	3	120.5328	0.248054	3.287382
TREATMENT	1058.26	5	211.6521	0.435576^{ns}	2.901295
Error	7288.694	15	485.9129		
Total	8708.552	23			

^{ns}not significant

Table 4. Marketable Yield per Plant (kg)

	BLOCKS					
TREATMENT	I	II	III	IV	Total	Mean
Michihili	8.25	4.2	6.2	10.2	28.85	7.2125
CR Chesney	2.5	5.4	3.9	1.75	13.55	3.3875
S & G	1.75	5.35	4.8	2.5	14.4	3.6
Summerstar	3.25	7.65	6.15	3.5	20.55	5.1375
Green Cool	2.5	2.7	3.8	4.28	13.28	3.32
Loo Green	4.65	3.9	1.75	4.6	14.9	3.725
TOTAL	22.9	29.2	26.6	26.83	105.53	26.3825
MEAN	3.82	4.87	4.43	4.47	17.59	4.40

ANOVA TABLE

SOURCE OF VARIATION	SUM OF SQUARES	DEGREE OF FREEDOM	MEAN SQUARE	COMPUTED F	$F_{0.05}$
BLOCKS	3.385612	3	1.128537	0.307916	3.287382
TREATMENT	46.96477	5	9.392954	2.562819^{ns}	2.901295
Error	54.97631	15	3.665088		
Total	105.3267	23			

^{ns}not significant

Table 5. Non-marketable Yield per Plant (kg)

	BLOCKS					
TREATMENT	I	II	III	IV	Total	Mean
Michihili	0	1	2	0	3	0.75
CR Chesney	1	0	0	7	8	2
S & G	2.5	0	1	2.5	6	1.5
Summerstar	0.5	0	0.5	0.8	1.8	0.45
Green Cool	1.25	0.5	0.7	0.25	2.7	0.675
Loo Green	8	0.8	0	1	9.8	2.45
TOTAL	13.25	2.3	4.2	11.55	31.3	7.825
MEAN	2.21	0.38	0.70	1.93	5.22	1.30

ANOVA TABLE

SOURCE OF VARIATION	SUM OF SQUARES	DEGREE OF FREEDOM	MEAN SQUARE	COMPUTED F	$F_{0.05}$
BLOCKS	14.49542	3	4.831806	1.046493	3.28738
TREATMENT	13.07208	5	2.614417	0.566242^{ns}	2.90129
Error	69.25708	15	4.617139		
Total	96.82458	23			

^{ns}not significant

Table 6.ROI on Michihili Variety per Plot. Total Expenses ÷ Treatment

EXPENSES	QUANTITY	UNIT PRICE	TOTAL
Land preparation	1 ½ days	200	50
Planting	1 day	200	33.33
Watering	7 days	200	233.33
Spraying	2 days	200	66.66
Weeding	1 ½ days	200	50
Gypsum	1 sack	900	150
Foliar	1 liter	135	22.5
Gasoline	2 liters	48	16
Michihili	2 pack	45	90
			Total= 711.78

*Total Expenses = 711.78 = 177.94
4 replication 4

ROI= Total Net Income – Total expenses
Total Expenses

Given: 5.17

Price: 60 (5.17)

ROI= 310- 177.94x 100
177.94
ROI = 74.21 %

Table 7.ROI on Cr Chesney Variety per Plot. Total Expenses ÷ Treatment

EXPENSES	QUANTITY	UNIT PRICE	TOTAL
Land preparation	1 ½ days	200	50
Planting	1 day	200	33.33
Watering	7 days	200	233.33
Spraying	2 days	200	66.66
Weeding	1 ½ days	200	50
Gypsum	1 sack	900	150
Foliar	1 liter	135	22.5
Gasoline	2 liters	48	16
Cr Chesney	1 pack	100	100
			Total= 721.78

*Total Expenses = 721.78 = 180.44
4 replication 4

ROI= Total Net Income – Total expenses
Total Expenses

Given: 3.39

Price: 60 (3.39)

ROI= 203.4 – 180.44x 100
180 .44

ROI = 12.72 %

Table 8.ROI on S & G Variety per Plot. Total Expenses ÷ Treatment

EXPENSES	QUANTITY	UNIT PRICE	TOTAL
Land preparation	1 ½ days	200	50
Planting	1 day	200	33.33
Watering	7 days	200	233.33
Spraying	2 days	200	66.66
Weeding	1 ½ days	200	50
Gypsum	1 sack	900	150
Foliar	1 liter	135	22.5
Gasoline	2 liters	48	16
S & G	1 pack	220	220
			Total= 841.78

*Total Expenses = 841.78 = 210.44
4 replication 4

ROI= Total Net Income – Total expenses
Total Expenses

Given: 4.35

Price: 60 (4.35)

ROI= 261-210.44 x 100
210.44

ROI = 24.02 %

Table 9.ROI on Summerstar Variety per Plot. Total Expenses ÷ Treatment

EXPENSES	QUANTITY	UNIT PRICE	TOTAL
Land preparation	1 ½ days	200	50
Planting	1 day	200	33.33
Watering	7 days	200	233.33
Spraying	2 days	200	66.66
Weeding	1 ½ days	200	50
Gypsum	1 sack	900	150
Foliar	1 liter	135	22.5
Gasoline	2 liters	48	16
Summerstar	2 pack	75	150
			Total= 771.78

*Total Expenses = 771.78= 192.94
4 replication 4

ROI= Total Net Income – Total expenses
Total Expenses

Given: 5.14

Price: 60 (5.14)

ROI= 308.4 – 192.94 x 100
192.94

ROI = 59.84 %

Table 10.ROI on Green Cool Variety per Plot. Total Expenses ÷ Treatment

EXPENSES	QUANTITY	UNIT PRICE	TOTAL
Land preparation	1 ½ days	200	50
Planting	1 day	200	33.33
Watering	7 days	200	233.33
Spraying	2 days	200	66.66
Weeding	1 ½ days	200	50
Gypsum	1 sack	900	150
Foliar	1 liter	135	22.5
Gasoline	2 liters	48	16
Green Cool	2 pack	75	150
			Total= 771.78

*Total Expenses = 771.78 = 192.94
4 replication 4

ROI= Total Net Income – Total expenses
Total Expenses

Given: 4.06

Price: 60 (4.06)

ROI= 244 – 192.94 x 100
192.94

ROI = 26.46 %

Table 11.ROI on Loo Green Variety per Plot. Total Expenses ÷ Treatment

EXPENSES	QUANTITY	UNIT PRICE	TOTAL
Land preparation	1 ½ days	200	50
Planting	1 day	200	33.33
Watering	7 days	200	233.33
Spraying	2 days	200	66.66
Weeding	1 ½ days	200	50
Gypsum	1 sack	900	150
Foliar	1 liter	135	22.5
Gasoline	2 liters	48	16
Loo Green	1 pack	200	200
			Total= 821.78

*Total Expenses = 821.78 = 205.45
4 replication 4

ROI= Total Net Income – Total expenses
Total Expenses

Given: 3.73

Price: 60 (3.73)

ROI= 223.5 – 205.45 x 100
205.45

ROI = 8.78 %