

**INSECTICIDE SCREENING IN CABBAGE (*Brassica oleracea*
var. Capitata L.)**

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In the early days, Maranaos were not vegetable eaters. It was believed that vegetables were food for the poor. Now with the scarcity of previously abundant fish in Lake Lanao, the new generation is learning to eat vegetables. They are beginning to realize the nutritional, medicinal and even socio-economic values of vegetables.

Cabbage (*Brassica oleracea* var. *Capitata L.*) is one of the most important vegetables well liked by the Maranaos. This is very rich in vitamins and minerals. Among the vegetables grown in the Philippines, this crop ranks fifth in monetary returns.

The Maranaos are unaware that their homeland is one of the gifted lands in the country due to its climate that favors successful vegetable production. However, the few beginners in vegetable raising particularly in cabbage-growing encounter problems with insect pests. This is partly due to poor knowledge in vegetable production technology. Some growers understand that chemicals will provide an immediate control of insect pests but there are instances when chemical control measures are unsuccessful due to improper use, such as inappropriate insecticide, inadequate dosages and wrong timing of application. It should be borne in mind that most insecticides are specific in terms of insects that can be controlled. There are also cases when the target pests become resistant to a particular insecticide. In this regard, there is a need to check from time to time the most appropriate chemical against a pest in question.

Several investigators have reported the variations of insecticides in controlling insect pests of cabbage. Diamondback moth, the most important insect pest of cabbage at present was effectively controlled by Phosdrin (Calora, et al., 1969); Spanone, Surecide, Hostathion and Diazinon (Su et. al., 1976); Vegetox and Sumicidin (Masnar, 1978; Sanguila, 1978); and Endusulfan, Sevin, Parathion, Malathion, Rotenone, Mevemphos and Methoxychlor (Davidson and Pears, 1969). The insecticides above can also control other pests of cabbage like cabbage worm, cabbage looper, cabbage moth, cabbage butterfly, flea beetle, common cutworm and aphids. However, some may not be effective if insect population is high.

This work was aimed to find out the most effective insecticide against insect pests of cabbage on the Mindanao State University campus and vicinity. There were only few entries because only readily available insecticide in the locality was included.

Materials and Methods

Place and duration of study. The study was conducted at the Research Area of the College of Agriculture, MSU Marawi City, from December 7, 1978 to March 10, 1979.

Variety used. The heat tolerant F₁ KY Cross was used in this study.

Treatments. The following insecticides were used as treatments : Sumicidin 3 EC, Vegetox, Thiodan 35 EC, Azodrin 202-R and Malathion, I₁, I₂, I₃, I₄, and I₅, respectively. One treatment (I₆) was not sprayed to serve as control. Insecticides were applied at the manufacturer's recommended rate.

Experimental design. It was conducted in randomized complete block design (RCBD) with three replications. Each plot was a double row containing 24 plants.

Planting. Seeds were sown in a seedbed. It was transplanted 24 days after sowing. The plants were spaced 40 cm apart in a row. Furrows were set at 75cm interval.

Fertilizer application. Fertilizer was applied at the rate of 240-60-60 kg/ha of N, P₂O₅ and K₂O, respectively. Animal manure was applied at the rate of 200 gm/hill. All the required P and K, manure and 40 per cent of N were incorporated into the soil at transplanting. The other N requirement was split into 3 side dressings at 9, 23 and 30 days after transplanting.

Maintenance of the experimental plots. Weeding operations were done whenever necessary. Dithane M-45 was sprayed to control diseases. The soil was kept in good moisture conditions by frequent watering.

Harvesting. The heads were harvested when they were compact and firm. The data collected were: Marketable yield per hectare, mean head weight, mean vegetative weight, maturity, disease damage rating and insect damage rating. Insect damage rating was based on insect counts three days after every spraying and on subjective rating using 1 to 4 rating scale where 1 is assigned to undamaged plots and 4 to severely damaged plots.

Results and Discussion

Marketable yield. There was a significant difference among six treatments (Table 1). The highest significant yield of 13.26 tons/ha was harvested from the plants treated with Sumicidin. The second highest yielding plants of 12.12 tons/ha were taken from plots applied with Vegetox. Other treatments showed very low yields.

The high yielding ability of the plants treated with Sumicidin and Vegetox is due to low insect damage associated with low insect damage associated with low insect population. This proved that the two insecticides were lethal to the insect pests feeding on the plants. Apparently, insects on the plants would be killed few days after treatments. However, the yields of the plants were still very low considering the standard yield of the variety used in this study. The low yields might be due to sub-optimal cultural practices applied to the crop.

Mean head weight. The heaviest significant head weight of 397.9 gm was obtained from the plants sprayed with Sumicidin

(Table 1). The lightest head weight of 43.3 gm was exhibited by the plants treated with Malathion. Differences among treatments were highly significant.

The plants with minimum insect damages were the ones that exhibited heavier head weight. On the other hand the heading efficiency of severely damaged plants was considerably reduced.

Mean vegetative weight. There were significant variations in vegetative weight (Table 1). The significantly heavier vegetative growth was taken from the plants sprayed with Sumicidin. The other treatments except for Vegetox-treated plants showed very low vegetative growth.

Similar situation observed in marketable yield and head weight differences is happening in vegetative weight variations. Heavier plants were found to be minimal in insect damages. The insects do not only reduce the weight of the plants by feeding on them but affect the efficiency of the leaves to undergo photosynthetic activities.

Maturity. There was no significant variation in the number of days to mature (Table 1).

Disease damage rating. There was no significant difference in disease damages (Table 2). Only alternaria leaf spot was found to occur but the severity was very low and uniform among treatments.

Insect damage rating. The differences among treatments were significant (Table 2). Vegetox and Sumicidin-treated plants exhibited low insect damages rating. The control unsprayed plants and the plants treated with the other chemicals showed high insect damages.

Out of many species of insect pests attacking cabbage, only diamond-back moth and cabbage worm were found to occur in the field during the duration of the experiment. There was a tremendous increase of the number of these insect pests from the first to the last insect counts.

Number of diamond-back moths. There was a significant variation among treatments on the first (30 DAT), second (65 DAT) and the last counting at harvest (Table 3). On the first count-

ing at 30 DAT, the highest significant number was observed from the plants sprayed with Azodrin. The lowest significant number was observed from the plants treated with Sumicidin.

At 65 DAT and at harvesting, the highest significant numbers were exhibited by the plants treated with Malathion. The lowest number was also observed from Sumicidin-treated plants. The number of diamond-back moth in Vegetox-treated plants was comparable to the number in Sumicidin-sprayed ones.

Number of cabbage worm. At 30 DAT, there was no variation observed among treatments (Table 4). However, significant differences were noted at 65 DAT and at harvesting. The lowest number was also found in plants sprayed with Sumicidin.

The number of insects found in a plant directly or indirectly affects the performance of the plant. If a plant is thickly populated with insects, this would imply that more organisms would feed on the plant. Consequently, the weight of the plant will be reduced tremendously. Insects will not only reduce weight but also destroy the site of photosynthesis, thus, affecting the food producing capacity of the plant which has a bearing in growth and development.

The presence of a greater population of insects in plants applied with Azodrin, Thiodan and Malathion indicates that these insecticides are not lethal to the pests in question. It is possible that the surviving insects acquire mechanisms for resistance or the dosage used was insufficient to exert toxic effect. Another explanation would be that those insecticides might not be designed for those insect pests not affected.

Conclusion

From the observations in this study, it is concluded that Sumicidin and Vegetox have the most potent effects on diamond-back moth and cabbage worm. In this regard, cabbage growers may use these insecticides but there is no guarantee that the effectiveness of these chemicals will last longer because insect pests are ca-

pable of acquiring mechanisms for pesticides resistance. However, one way to minimize this problem is to use these chemicals alternately with other insecticides so that insects would not build up resistance mechanisms.

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Table 1. Marketable yield, mean head weight, mean vegetative weight and maturity cabbage treated with different insecticides.

Treatment	Marketable yield (ton/ha)	Mean head weight (gm)	Mean vegetative wt. (gm)	Maturity (days)
Sumicidin	13.26 ^a	397.92 ^a	1007.5 ^a	73
Vegetox	12.12 ^{ab}	367.75 ^{ab}	940.6 ^a	72
Thiodan	6.81 ^{bc}	204.58 ^{bc}	570.4 ^b	70
Azodrin	4.06 ^c	122.08 ^c	430.8 ^b	70

Malathion	1.44 ^c	43.32 ^c	329.8 ^b	72
Control	5.66 ^c	170.00 ^c	603.9 ^b	70
Mean	7.22	216.94	647.17	71
C.V. (%)	28.6	28.6	16.51	2.2
LSD .05	5.83	17.4	301.95	NS

Within column, means with uncommon letters are significantly different at 5% probability using LSD method.

NS – not significant.

Table 2. Disease damage and insect pests damages in Cabbage treated with different insecticides.

Treatments	Disease damage	Insect damage
Sumicidin	1.68	1.22 ^c
Vegetox	1.68	1.58 ^b
Thiodan	1.87	2.35 ^a
Azodrin	1.68	2.54 ^a
Malathion	1.77	2.62 ^a
Control	1.77	2.35 ^a
Mean	1.74	2.11
C.V. (%)	9.45	6.00
LSD .05	NS	0.307

Within column, means with uncommon letters are significantly different at 5% probability using LSD method.

Rating scale: 1-no damage, 2-light damage, 3-moderate damage, 4-heavy damage.

Table 3. Number of diamond-back moth in cabbage treated with different insecticides.

Treatment	30 DAT*	65 DAT*	Harvesting
Sumicidin	0.71 ^b	0.87 ^b	0.89 ^b
Vegetox	0.94 ^{ab}	1.02 ^b	1.03 ^b
Thiodan	1.08 ^{ab}	16.14 ^a	16.18 ^a

Azodrin	2.08 ^a	18.08 ^a	18.82 ^a
Malathion	1.28 ^{ab}	18.87 ^a	18.92 ^a
Control	1.69 ^{ab}	18.76 ^a	18.80 ^a
Mean	1.30	12.41	12.44
C.V. (%)	31.53	16.50	16.23
LSD .05	1.16	5.78	5.70

Within column, means with uncommon letters are significantly different at 5% probability using LSD method.

*DAT – days after transplanting.

Table 4. Number of cabbage worm in cabbage treated different insecticides.

Treatments	30 DAT	65 DAT	Harvesting
Sumicidin	0.71	0.84 ^b	0.84 ^b
Vegetox	0.77	0.89 ^b	0.91 ^b
Thiodan	0.73	15.21 ^a	15.22 ^b
Azodrin	1.01	18.46 ^a	18.48 ^a
Malathion	0.71	16.09 ^a	16.11 ^a
Control	1.70	18.45 ^a	18.47 ^a
Mean	0.94	11.66	11.67
C.V. (%)	41.75	17.30	17.30
LSD .05	NS	5.70	5.70

Within column, means with uncommon letters are significantly different at 5% probability using LSD method.