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EFFECTS OF DIFFERENT LEVELS OF DECOMPOSED POULTRY MANURE ON YIELD OF CABBAGE (*Brassica oleraceae* L.) AT ANSE BOILEAU, SEYCHELLES

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ABSTRACT

Field experiments were conducted between April and September, 2003 and 2004 at the Vegetable Evaluation and Research Station, Anse Boileau, Seychelles to assess the effects of different levels of decomposed poultry manure and to determine the optimal rate that would maximize cabbage yield under Seychelles conditions. The treatment consists of five levels of decomposed poultry manure (DPM) at 0, 10, 20, 30 and 40 t/ha. It was replicated four times in a randomized complete block design. Results of the study showed that all DPM treatments significantly improved head length, head width, head weight per plant and yield than the 0 t/ha DPM, however the best yield was obtained from the 30 t/ha DPM. The application of 30 t/ha DPM significantly (P≤0.05) increased cabbage yield by 31.7 % and 26.4 % in the year 2003 and 2004 respectively compared to the 0 t/ha DPM treatment. The application of 30 t/ha DPM was therefore recommended.

Keywords: Manure application, Cabbage, Yield response.

NTRODUCTION

Cabbage (*Brassica oleraceae* L.) belongs to the Brassicaceae family and is a cool season crop (Best, 2000). It is consumed raw or cooked with other vegetables and mostly grown as a commercial crop. It contains 93 ml water, 1.5 g protein, 0.2 g fat, 4 g carbohydrate, 40 mg calcium and 0.5 g iron/100 g sample (Moamogwe, 1995).

In Seychelles, there is an increasing demand for the cultivation of cabbage to meet the needs of the urban markets. Cabbage is one of the priority vegetable crops in the diet of the Seychelles people (Grubben, 1997).

Poultry manure, an efficient organic fertilizer is readily available in the Seychelles, in sufficient amounts and it is an important source of plant nutrients (Reddy and Reddi, 1995). In addition to releasing nutrients, also improves the physical properties of soil. It has been reported that 30 % of nitrogen from poultry litter is in urea or ammonium form and is hence readily available (Sunassee, 2001). Its average primary nutrient content is 3.03 % N, 2.63 % P_2O_5 and 1.4 % K_2O (Reddy and Reddi, 1995).

Yield response of leafy vegetable crop such as lettuce to different levels of poultry manure application has been investigated by (Cesalis, 2002), in which he reported that manure be applied at the rate of 20 t/ha. Similarly, Sunassee (2001) in his research investigation on the use of poultry litter for vegetable production in Mauritius advised that the manure be applied at a rate of 15 t/ha for high yields.

Seychelles has a varied environmental condition and therefore optimal application levels of poultry manure could differ for specific crops. This study was therefore designed to evaluate the yield response of cabbage to different levels of poultry manure with the objective of determining the optimal rate that would maximize cabbage yield under Seychelles conditions

MATERIALS AND METHODS

Field trials were conducted between April and September, 2003 and 2004 at the Vegetable Evaluation and Research Station, Anse Boileau, Seychelles, which lies between longitude 7^0 $26^/$ and 7^0 $53^/$ E and latitude 5^0 $17^/$ and 5^0 $26^/$ N. The annual rainfall ranges from 300 mm-400 mm. The experiment was sited on sandy soil to evaluate the effects of different levels of decomposed poultry manure on yield of cabbage. The variety of cabbage used was 'Spring Light'. It is popularly grown by

farmers, both for home use and source of income. Seedlings were developed in the nursery in which watering, application of starter fertilizer Nitrophoska (NPK 12-12-10) at the rate of 100 g per plot area of 3.0 m^2 was applied following recommendation by Ripjma (1991), while pesticide application with Nomolt (a.i. Teflubenzuron) at the rate of 7 ml mixed with 15 l of water was sprayed following recommendation by Valenzuela (2002). The field site was cleared and rotovated. The experimental area was 79.4 m^2 while each plot area was 3.0 m^2.

The decomposed poultry manure (DPM) constituted the treatment at five levels namely: 0 t/ha, 10 t/ha, 20 t/ha, 30 t/ha and 40 t/ha. The treatments were laid out in a randomized complete block design (RCBD) with four replications. Planting holes measuring 6.0 cm depth were dug at a spacing of 50 cm x 50 cm between and within rows in each treatment plot. DPM at the different rates of 125 g, 250 g, 375 g and 500 g (equivalent of 10 t/ha, 20 t/ha, 30 t/ha and 40 t/ha) were applied in each hole a day before transplanting. Seedlings were transplanted in early June, four weeks after sowing (W.A.S) to each plot. Each plot consisted of two rows to which 12 plants per row were transplanted giving a total population of 24 plants per plot (80,000 plants per hectare equivalent).

Irrigation was applied using the drip system. Weeding was manually carried out by handpicking as the weeds appeared until harvest, while pests were controlled 6 weeks after transplanting by foliar spray with Nomolt at the rate of 12 ml mixed with 30 l of water (Valenzuela, 2002). Harvesting was done in early September when matured heads were produced.

Data taken included mean head length, mean head width, mean weight of non-wrapper leaves, mean head weight per plant and yield (t/ha). The data were statistically analyzed using the Analysis of Variance (ANOVA) while the Least Significant Difference (LSD) was used to separate treatment means following the method of Obi (1990).

RESULTS AND DISCUSSION

In Table 1, the meteorological information of the trial site from April to September 2003 and 2004 is given. The average monthly temperature over the years ranged from 22.2 ^{0}C to 29.2 ^{0}C. This range was considered optimal for the growth and development of cabbage. This view was supported by Cooper (2000). He reported that optimal temperature range of 20 – 30 ˚C is ideal for cabbage. In the months of May and June, the highest average monthly rainfall and highest number of rainy days were recorded. The highest average relative humidity of 85.3 % and 85.5 % were recorded for the month of June.

Total N value in the soil over the years was low (0.06 % and 0.09 %). Similarly, the soil had a medium level of P (8.6 mg/kg^{-1} and 9.2 mg/kg^{-1}) with a corresponding low level of K (0.08 % and 0.10 %) for the years 2003 and 2004 respectively. Relatively moderate amounts of exchangeable bases (Ca and Mg) were present in all the soil units. Over the years, organic matter was low (1.7 % and 1.5 %) while the pH in water was near neutral (Table 2).

All the four levels of DPM gave increased head length, head width, weight of non-wrapper leaves, head weight per plant and yield than the 0 t/ha DPM (Table 3). DPM rate at 30 t/ha gave the highest mean head length (11.8 cm and 13.2 cm) and head width (12.9 cm and 13.4 cm) for year 2003 and 2004, respectively. This agreed with a similar work in Madagascar by Rajkomar (2002), where the highest head length and head width were obtained with the application of 30 t/ha DPM. However, the mean weight of non-wrapper leaves was not significantly different irrespective of the levels of DPM application.

The application of 30 t/ha DPM also gave the highest mean head weight per plant (1.30 kg and 1.26 kg) and yield of 35.6 t/ha and 34.8 t/ha respectively for year 2003 and 2004, respectively. These were significantly ($P<0.05$) higher than those obtained from other levels. This rate in the year 2003, significantly ($P<0.05$) increased mean head weight per plant and yield by 50.8 % and 31.7 % respectively compared to those obtained from 0 t/ha. A similar trend was obtained in 2004, were the application of 30 t/ha DPM significantly increased mean head weight per plant and yield by 39.7 % and 26.4 %, respectively, compared to those obtained from the plots with no application of DPM. This result, however do not agree with a similar investigation in Malaysia by Talekar (2000), who reported that the highest head weight per plant and best yield were obtained with the application of 20 t/ha of decomposed poultry manure. The difference in results could be attributed to varietal response to different environments of the two study locations and to the relatively low soil nutrient status of the study site in the Seychelles.

Table 1: Meteorological information for Anse Boileau, Seychelles (April-September) 2003, 2004.

	Average monthly Rainfall (mm)	Average monthly temperature (^{0}C)		Average relative humidity (%)
2003		Max.	Min.	
April	12.3(20)$^+$	22.5	28.2	84.2
May	142(22)	292	232	841
June	15.3(24)	28.3	23.1	85.3
July	4.0(11)	28.4	22.8	80.1
August	3.6(17)	27.5	22.2	81.4
September	3.4(15)	26.6	22.6	81.6
2004				
April	13.4(18)$^+$	28.3	22.4	84.2
May	15.1(20)	28.2	22.5	84.0
June	18.6(27)	27.7	23.2	85.5
July	9.6(14)	27.5	22.3	82.1
August	7.5(16)	28.2	23.1	82.3
September	7.3(14)	27.4	23.4	82.4

Values in parenthesis indicate number of rainy days.
Source: Vegetable Evaluation and Research Meteorological Station, Anse Boileau Seychelles

Table 2: Physico-chemical properties of the soil of experimental site, 2003 and 2004.

Parameter	2003	2004	Method of analysis
Organic matter	1.7 %	1.5 %	Walkley-Black method
Nitrogen	0.06 %	0.09 %	Kjeldahl method
P_2O_5	8.6 mg/kg^{-1}	9.2 mg/kg^{-1}	Flame photometric method
K	0.08 %	0.10 %	Oxidation method
Ca	2.04 meq/100 %	2.13 meq/100 %	A.A.S.
Mg	1.04 meq/100 %	2.01 meq/100 %	A.A.S.
pH (H_2O)	6.4	6.8	pH meter
pH ($Cacl_2$)	5.3	5.7	pH meter

Type of Soil: Sandy
Source: Soil Science Laboratory, Grand Anse, Mahe, Seychelles.
A.A.S.: Atomic Absorption Spectrophotometer

Table 3: Yield components of cabbage at the different levels of decomposed poultry manure for the year 2003 and 2004.

	Mean head length (cm)		Mean head width (cm)		Mean weight of non-wrapper leaves (g)		Mean head weight per plant (kg)		Yield (t/ha)	
Treatments	**2003**	**2004**	**2003**	**2004**	**2003**	**2004**	**2003**	**2004**	**2003**	**2004**
0 t/ha	7.7	8.9	8.6	9.2	10.2	9.8	0.64	0.76	24.3	25.6
10 t/ha	10.4	11.3	11.2	12.7	10.5	10.9	0.95	0.94	29.4	29.8
20 t/ha	10.6	11.3	11.8	12.7	11.3	10.5	0.97	0.99	30.3	31.0
30 t/ha	11.8	13.2	12.9	13.4	11.6	12.4	1.30	1.26	35.6	34.8
40 t/ha	9.7	11.0	11.7	11.6	10.7	11.0	0.86	0.93	31.4	29.9
Means	10.0	11.1	11.2	11.9	10.9	10.9	0.94	0.98	30.2	30.2
LSD0.05	2.4	4.1	3.7	3.4	NS	3.8	0.2	0.1	3.7	3.2
CV(%)	9.46	7.20	6.32	4.80	9.34	8.10	13.41	15.63	6.69	8.20

NS: Not Significant

CONCLUSION

From the results obtained, it can be concluded that the application of 30 t/ha of decomposed poultry manure is recommended. This application is associated with higher head length, head width, weight of non-wrapper leaves, head weight per plant and yield respectively. It is recommended that the experiment be conducted across different locations with varied ecology in Seychelles

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