The effect of conventional and organic farming on cabbage (*Brassica oleracea* var. *capitata* L.) yield - a case study in Lembang, Indonesia

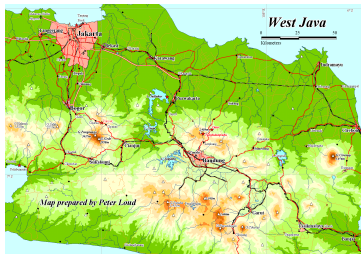
Yeyep Dintan[1,4] , Ronald. F. Kühne[1], Anas D. Susila[2], Elke Pawelzik[3]

[1] University of Göttingen, Department of Crop Sciences, Agronomy in the Tropics

[2] Bogor Agricultural University, Indonesia, Department of Horticulture, University Farm

[3] University of Göttingen, Department of Crop Sciences, Product Quality

[4] Regional Agricultural Training Centre (BBDAH), Kayuambon-Lembang, Indonesia



Introduction

Cabbage is among the six prime vegetables grown in Indonesia. A major production area for export and domestic consumption is located in the highland (1250 masl) near Lembang, West Java. High doses of mineral N with frequent chemical pesticide application is the most common farming practice, with high potential risk to environment and consumer safety. Farm yard manure and biopesticides are major elements of organic farming which has been suggested as a viable alternative.

Material and Methods

A field experiment (randomised complete blocks (r=3)) was conducted in 2005 on the station of the Indonesian Vegetables Research Institute, Lembang to test if chicken manure (20 t/ha) and a biopesticide (*Bacillus thuriengensis* suspension) can maintain yield of an early (Green Coronet) and late (Gloria Ocena) cabbage cultivar on an Andosol as compared to standard practices (100 and 200 kg N/ha with weekly applications of Chlorfenafir) and an additional zero control.

Results and Conclusions

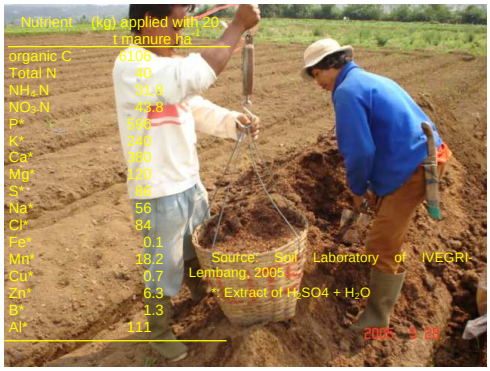
Cabbage growth and yield was the lowest in the zero control across both culticars (23 t/ha net weight). Moreover, 40 % of the heads were damaged by cabbage moth (*Plutella xilostella*) and head caterpillar (*Crocydolomia binotalis*) to such an extent that it would not be acceptable for consumers (Tab. 1).

Biopesticide combined with manure application had a net yield of 40 t/ha, with an average damage level of 17 %. In general, the synthetic pesticide application combined with 200 kg N/ha had the highest net yield (57 t/ha) and lowest damage (5%) across both cultivars (Tab.1).

However, explorative analysis for synthetic pesticide residue showed contamination levels (0.9 – 11 mg/kg) high above the critical limit (0 mg/kg).

Furthermore, high nitrate-N contents in the heads (118 mg/kg, Tab. 2) as well as very high residual nitrate-N in the topsoil (425 mg/kg, Tab.3) clearly show that further research and monitoring is necessary to improve consumer safety and reduce pollution risk to the groundwater.

Manure application alone could not reduce nitrate levels of plants and soil to an acceptable level, further research in crop rotation and use of catch crops are suggested to improve the N efficiency of manure applications.



Tab.1: Final net yield (t/ha) of cabbage heads from two cultivars and insect damage (% plants) at 49 days after transplanting as affected by organic and conventional farming treatments.

Treatment	Yield (t/ha)		Damage (% of plants)	
	Green coronet	Gloria ocena	Green coronet	Gloria ocena
Zero Control	24.1^{a}	22.2^{a}	34.8^{a}	45.9^{a}
Biopesticide with 20 t/ha manure (organic)	45.1^{b}	35.0^{a}	17.0^{b}	17.0^{b}
Conventional				
0 N	44.3^{c}	46.6^{ab}	10.4^{a}	5.2^{a}
100 N	56.4^{b}	42.6^{b}	5.6^{b}	7.4^{a}
200 N	64.2^{a}	49.9^{a}	5.2^{b}	4.8^{a}
0 t/ha manure	49.2^{b}	40.6^{b}	6.7^{a}	5.9^{a}
20 t/ha manure	60.7^{a}	52.1^{a}	7.4^{a}	5.7^{a}

Tab. 2. NO_3-N content of cabbage (ppm) as affected by manure and N levels for two cultivars.

Treatments	Cultivars	
	Green coronet	Gloria ocena
Manure at 0 t ha^{-1}	118.8^{a}	120.7
Manure at 20 t ha^{-1}	105.8^{a}	110.2
N rate at 0 kg ha^{-1}	141.0^{a}	150.1
N rate at 100 kg ha^{-1}	104.3^{ab}	110.9
N rate at 200 kg ha^{-1}	91.7^{b}	100.7
Grand Mean	112.3	118.5
Critical level	> 200 ppm: (FAO, 2000)	

Values with the same superscript letters in a column are not significantly different according to LSD at 5 %

Tab. 3: NO_3-N content of soil (ppm) after harvest as affected by manure and N levels under cultivar Green coronet

Treatments	NO_3-N content of soil (ppm)
Manure at 0 t ha^{-1}	378^{a}
Manure at 20 t ha^{-1}	378^{a}
N rate at 0 kg ha^{-1}	274^{c}
N rate at 100 kg ha^{-1}	443^{a}
N rate at 200 kg ha^{-1}	413^{b}
Critical level (FAO, 2000)	>10 ppm

Values with the same superscript letters in a column are not significantly different according to LSD at 5 %

Acknowledgements

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