CABBAGE PRODUCTION AND SIGNIFICANCE OF CABBAGE PESTS IN EAST NEW BRITAIN

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ABSTRACT

*A two year study was conducted at the Entomology Section of LAES to determine the extent of cabbage cropped areas, to evaluate the present pest status and the target group of pests for a potential integrated pest management concept. Round cabbage is mainly cropped in permanent large scale production on farms where it is threatened by insecticide resistant Diamondback Moth (*Plutella xylostella*). In small scale production of round cabbage without insecticidal sprays and cropping of pat choi,* Crocidolomia pavonana *and* Spodoptera litura *were found to be most detrimental. The total area covered by brassicas on the Gazelle Peninsula is estimated at 250 ha/ year.*

INTRODUCTION

Brassicas are widely grown throughout tropical countries and are of considerable significance in the internal market economy (TALEKAR 1992). Despite being an introduced vegetable in Papua New Guinea (PNG) cabbage is of increasing significance, particularly near larger towns and in relatively densely populated areas. The reasons for this might be its fast growing properties and high producing abilities. These characteristics are required if agriculture production is to change from shifting cultivation to constant cultivation.

However, cropping of cabbage is threatened by some important pests, mainly Lepidoptera (WATERHOUSE & NORRIS 1987). Among these is the Diamondback Moth (*Plutella xylostella*) which rapidly develops resistance to pesticides. It has been reported that farmers in some areas in Asia have stopped growing brassicas due to this insect. A comprehensive literature review is provided by TALEKAR & SHELTON (1993).

During 1993 and 1994, the Entomology Section of L.A.E.S. carried out an extensive study of cabbage pests under the humid lowland conditions of the Gazelle Peninsula in East New Britain. One aim of the study was to find out who are the main producers of cabbage in ENB and to get an idea of the production techniques used. This was needed to identify the target group for an Integrated Pest Management (IPM) package and the probable level of extension work needed. Secondly there was a need to identify what species of brassicas are being cropped, and by whom. The third and most important aim of the study was to find out if the cabbage pests were attacking the different cabbage varieties to the same extent and were the pests of the same significance at all sites over the Gazelle Peninsula. In other words the aim was to assess the present stage, inocular potential and spread of cabbage pests. This knowledge is a precondition for the development of an IPM for cabbage pests. A further aim was to discover if pesticide resistant diamondback moth (DBM) already exists in ENB.

METHODS

How was the information generated?

Since no reliable data for areas cropped with brassicas was available for East New Britain the following approach was chosen:

1. Monthly questionnaire was administered to customers of a supermarket (Anderson's Foodland) from August 1993

to August 1994.
2. Questionnaire was given to 30 schools or colleges as buyers and consumers from August 1993 to April 1995.
3. Questionnaire to market sellers (Rabaul, Kokopo & street markets) was administered at least fortnightly from August 1993 to April 1995.
4. Questionnaire was administered to extension workers from June 1993 to April 1995.
5. Questionnaire was administered to farmers from June 1993 to April 1995.

The areas identified for significant cabbage production were visited frequently. The farmers or farm managers were interviewed about the size of areas covered with brassicas during the year and cultivation techniques used with special regards to plant protection measures. Plants in the fields were checked for pest damage.

RESULTS

Producer: Who is growing cabbage in East New Britain?

On the Gazelle Peninsula the producers of brassicas can be divided into 3 groups.

1. Larger commercial producers (> 3 ha/year) who were cropping brassicas continuously during the year and over several years. At these sites, cabbage was cropped on fields in larger areas. Only three sites in ENB; Sonoma High School farm, Vudal University College farm and Ulatava Plantation fall in this category.

2. Institutions such as high schools, colleges, community schools and training centres present a second group. Students and staff cropped cabbage in small beds. However, the accumulated area can reach a considerable size (> 2.8 ha/year).

3. The wide range of small-farmers scattered over the whole Peninsula is considered as the third group.

The total area cropped by the above group is very difficult to assess since brassicas are often cultivated only occasionally or for limited periods and often at very hidden sites. A range of small farmers are associated with plantations and education facilities so that these areas have to be regarded as the main areas for cabbage production. In the area around Warangoi river and at the higher altitude site of Vunakanau (300-400 m.a.b.s.l.) there are many sites of small-scale cabbage production.

Who is cropping cabbage? What size of area and cultural techniques are used?

While rather detailed data about the extent of brassica cropping were available for group 1 and for areas where round cabbage was produced, it is difficult to assess the thousands of small sites planted with pak choi.

1. Round cabbage

Detailed data for round cabbage was available mainly because only few farmers knew how to grow it. Of all the brassicas, round cabbage requires the highest level of agriculture techniques. This could have been the reason for plantations and associated farmers to produce round cabbage (> 90%) and hardly by any small farmers on their own. Round cabbage is clearly regarded as a cash crop and agrochemicals (fertiliser & pesticides) were used frequently, although not always correctly. Round cabbage cropped in school gardens or by small holders usually had no or very little use of agrochemicals. The success of round cabbage cultivation varied in all three groups depending on the management skills (farm manager on plantations) and length of continuous brassica cultivation, altitude and the environment (group 2 and 3).

On plantations, areas cropped with round cabbage covered only roughly one third of fields, the rest is planted with *Saladia*, Pak choi and Chinese cabbage. In total, Chinese cabbages are also mainly cultivated by plantations, but play an inferior role in the markets. It is estimated that a total area of roughly 20 ha/year is cultivated with round cabbage. However, it is amazing that all these areas are situated in low-

lands although the "Baining" mountains are not that far away from the main markets (1-2 hours drive). A barrier may arise from the fact that it is only connected by rough roads.

2. Pak choi, *Saladia*

Small farmers and educational institutions mainly produce pat choi or *Saladia*. In a market survey carried out by LAES, 10% of the farmer indicated that they use fertiliser for pat choi and 34% use insecticides. However, it should be kept in mind that only the best products are regarded worth bringing to the market and therefore only the groups with comparable intensive agriculture were interviewed. It can be expected that less than 3-5% of all farmers are using fertiliser while 5-10% are using pesticides.

In addition, a good part of pak choi or *Saladia* serves for subsistence and often only a part appears in small rural markets. For this reason the data for the area covered by pak choi must be questioned and can only be roughly estimated. Moreover it was found that cabbage was only temporarily cultivated by group 2 and seasonally by group 3. This can also be seen in the markets. There is a strong fluctuation of supplies and prices during the year, with a perceptible shortage of vegetables in December, January and also around April/May. In the case of the second group this was determined by the term breaks while the reasons for the small farmers cropping seasonally were not obvious. As with other vegetables, it was found that at the small farmer-level cabbages were mainly grown by women.

Generally it can be stated, that on the Gazelle Peninsula much more pak choi cabbage and also *Saladia* were grown than round cabbage. The reasons for this are:-

1. it grows much faster
2. its seeds are cheaper
3. needs less input than round cabbage (fertiliser, pesticides)
4. will produce marketable crops even under sub-optimal conditions (less fertile ground, water, pests)

This above factors lead to the result that a lot of small farmers are producing pak choi and to a certain extent *saladia* where as only few larger farmers and very few small farmers are growing round cabbage. The area covered with pak choi might be 10 times the area cropped with round cabbage.

PEST STATUS

1. Round cabbage

All main producers of round cabbage were using insecticides. While on one plantation the manager had knowledge about the use of specific insecticides the others were using a range of broad spectrum insecticides, because one alone was no longer effective. However, at all three sites DBM caused significant damage at least temporarily, while the other severe pests suchas cabbage cluster caterpillar (*Crocidolomia pavonana*) and army worm (*Spodoptera litura*) were controlled by insecticide sprays.

At sites where no insecticides were sprayed at all disastrous losses (up to 98%) could be observed. Often the damage by *C. pavonana* and *S. litura* were usually so severe in the early stage that the damage caused by DBM was negligible - if any. However, field observations showed a clear preference of DBM and army worm for round cabbage.

At sites where brassicas are not grown continuously it was found that *C. pavonana* or *S. litura* were the dominant pests while this role was clearly played by DBM on the plantations especially if broad spectrum insecticides were applied frequently.

During periods of continuous heavy rainfall less damage by cabbage pests was observed than in dry periods. However, the dry period is usually very short in ENB (3-6 weeks). Particularly DBM seems to be very susceptible to heavy rainfall whereas *C. pavonana* seems less affected. Other pests such as aphids, locusts as well as flea beetle came up in the dry season, but never in significant numbers to cause any severe losses.

2. Pak choi

The survey indicated that *C. pavonana* was the main pest in pak choi. A clear preference of *C. pavonana* for pak choi could be observed at sites which remained unsprayed and where pat choi and round cabbage were cropped side by side.

DBM was only found in relatively few numbers on pat choi and only at sites where DBM was already abundant on round cabbage. Also army worms have been scarcely found on pat choi but are found quite often on round cabbage.

3. *Saladia* and Chinese cabbage

Similar to round cabbage, *Saladia* and Chinese cabbage were quite frequently damaged by DBM. However, since they grow much faster and are not forming heads the losses from this pest were much less than for round cabbage.

Are resistant DBM already abundant in ENB?

The production techniques for round cabbage in nurseries and fields of all three plantations followed the recommendations of LAES, choosing fast growing varieties, applying fertiliser and pesticides.

However, despite alternating use of broad spectrum insecticides in former times and of concentrations higher than recommended it was obvious that DBM was damaging, at least periodically, the cabbage at all three sites where cabbage is grown continuously. This clearly indicates resistant DBM were already present in ENBP and the development of an appropriate IPM and pesticide management strategy is urgently needed. This was also found by SAUCKE (1994 a) for the Central Province and the Highlands in PNG.

However, it should be stressed here that this is a problem of commercial producers but could also affect smallholder production. This is because of the active spread of resistant DBM by itself which also infected seedlings, being sold at markets. Thus resistant DBM might have spread all over Gazelle Peninsula.

Summary and Conclusions

Cabbage is of increasing importance for the nutrition of the local population especially in highly populated areas and in the internal market economy of East New Britain. While round cabbage and Chinese cabbage represent high value cash crops, pak choi and *saladia* also have significant importance for subsistence farming. Although round cabbage could easily become an alternative cash crop for small farmers, it is momentarily mainly cultivated on larger farms. Despite (and because) of broad spectrum pesticide applications the main pest for round cabbage on plantations is Diamondback Moth (*Plutella xylostella*).

The present official recommendations were not able to prevent the development of resistant DBM. At the small farmer level hardly any agrochemicals are used in ENB. In case round cabbage is cultivated, this is rather hazardous and might lead to losses up to 98% by *Crocidolomia pavonana* and *Spodoptera litura*. In small farmer gardens pest damage by DBM plays no role or an inferior role.

Usually, small farmers as well as educational institutions are cropping pat choi. However, this is endangered mainly by *C. pavonana*. Other pests are of no significance under the cropping conditions in ENB.

Therefore an IPM strategy must be developed for small farmers to enable them increase the production. A second IPM concept is needed to address the plantations. Emphasis should be placed in both concepts on pesticide management.

Selective, biodegradable pesticides and biocontrol should be an integrated part of these strategies as proposed by the author elsewhere and SAUCKE (1994 b).

It would be desirable if these concepts could be developed in co-operation with the target groups on station as well as on farm trials. Benefits for

farmers (increased productivity and income) and the consumers (permanent offer of high quality products, lower prices) in ENB would be the result.

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