East African Scholars Journal of Agriculture and Life Sciences
Abbreviated Key Title: East African Scholars J Agri Life Sci
ISSN 2617-4472 (Print) | ISSN 2617-7277 (Online) |
Published By East African Scholars Publisher, Kenya

OPEN ACCESS

Volume-2 | Issue-10 | Oct-2019 | DOI: 10.36349/EASJALS.2019.v02i10.008

Research Article

Impact of Cabbages Aphis (*Brevicoryne brassicae*) Growing Growth of Cabbages, Western Coast of Kivu Lake

N. Byamungu[1*], JA. K. Rubabura[2] and E.B. Bisimwa[3]

[1]Agricultural Technical Section, Bwindi Institute, B.P.:691/Bukavu, Bukavu, South Kivu, DR Congo
[2]Agricultural Entomology laboratory, Entomology Section, Research Centre in Natural Sciences, CRSN/Lwiro, DS/Bukavu, South Kivu, Democratic Republic of Congo
[3]Catholic University of Bukavu, UCB / Bukavu, B.P.: 281/Bukavu, Bukavu, South Kivu, DR Congo

*Corresponding Author
Byamungu Nshonja

Abstract: The study was conducted in province of South Kivu, Bukavu city at Bwindi Institute. The evaluation of the incidence of growing cabbage (*Brassica oleracea*) was the aim of this work. Enumeration of the cabbages harboring the aphid colony per plot was carried out and we calculated mean, standard deviation and making graphic in this study. At least 8(8,312 ± 5,089) cabbages per plot were sick or *B.brassicae* attack against 14 (13,625 ± 4,133) healthy cabbages. The most attack of *B. brassicae* cause considerable losses on cabbages at different plots: first (52,391%), nine (57,576%), ten (56,667%), eleven (92,857%), thirteen (71,875%) and fifteen (64,286%), and respectively twelve and twenty had 50%. The other plots (2, 3, 4, 5, 6, 7, 8, 14, 16, 17, 18, 19, 21, 22, 23, 24, 25, 26, 27, 28, 29, 30, 31, 32 and 33) have a less percentage of attack (5,000% to 45,000 %).The maximum incidences of *B.brassicae* reaches up92,857% and 5% minimum and 37,109% average. It is advisable for producers and other agricultural researchers to consider a positive fight against this insect in terms of quality of vegetable. The fight against *B.brassicae* should be done with the respect of environment.

Keywords: Aphis, Cabbages, Damages, South Kivu, Vegetables.

1. INTRODUCTION

In the Democratic Republic of Congo, as in most tropical regions, and even in almost all regions of the world, vegetable crops can be an essential component for poverty reduction and sustainable development (FAO, 2010).

However, the potential production of these crops is often limited by the damage caused by crop bio-aggressors (Cochard, L. *et al.*, 2012).

In the province of South Kivu, market gardening activities are practiced and generate income while creating employment and producing food products (vegetables) directly consumable (Vumba, M. B. *et al.*, 2015). This can be an answer to poverty and malnutrition. This production is noticed in all the big and small markets of Bukavu and its surroundings where the sellers display these vegetables. The others transport their vegetables by moving all the streets of the city in search of buyers. Cabbage (*Brassica oleracea*) is one of a multitude of vegetables sold and consumed by the people of Bukavu and its surroundings. Other vegetables are amaranths, cassava leaves, bean leaves, sweet potato leaves, squash leaves, etc. The cabbages sold and consumed in Bukavucome mainly from the neighboring territory of Kabare and to a lesser extent from the territory of Walungu and Uvira (2000).

However, Walungu and Uvira (2000) show that cabbages grown in South Kivu province and all cabbages are attacked by various insect pests and diseases.

The cabbage crop is prone to attack by multiple pests causing significant yield declines. This is notably the case of the crucifer moth (*Plutella xylostella* L.); one of its main pests, whose damage sometimes reaches up to 90% of losses in cruciferous plants

Quick Response Code

Journal homepage:
http://www.easpublisher.com/easjals/

Article History
Received: 12.09.2019
Accepted: 23.09.2019
Published: 05.10.2019

(AUMN, 1993; Ndiaye, M. 2017). Indeed, Cochard *et al.*,. in 2012 (Wade, S.C. 2003) specify that the main pests on cabbages cause economic losses are cabbage worm (*Pieris brassicae*), cabbage moths (*Mamestra brassicae),* caterpillar (*Autographa gamma*) ,diamondback moth (*Pluttella xylostella*), crucifer flea beetles (Phyllotreta nemorum), whiteflies (*Trialeurodes vaporariorum*), cabbage maggot (*Delia radicum*). Other pests are cutworms (*Agrostis segetum*), cricket (*Brachytripes menbranaceus*), snails (*Helix aspersa*) and ladybug (*Henosepilachna elaterii*) (Wade, S.C. 2003). In 2012 show that research on the attack of these pests can cause considerable losses on cabbages at different stages of growth.

The aphids found on cabbage in Africa, for example in the Niayes zone (Senegal) and in particular in the Great Lakes of Central Africa, for example in eastern DRC in South Kivu, are the ash aphid in the cabbage (*Brevicoryne brassicae* L.), turnip aphid (*Liphaliserysimi*Kaltenbach) and green peach aphid (*Myzus persicae* Sulzer) (Yarou, B.B. *et al.*, 2017). In case of strong outbreaks, the symptoms observed are the rolling of young leaves, signs of chlorosis, a general deformation of the leaf and a thickening of leaves. The most important damage is the transmission of viruses and the development of saprophytes following the production of honeydew (Yarou, B.B. *et al.*, 2017). Aphids of cabbage (*Brevicoryne brassicae*) are insects that live in colonies on the leaves and at the stem. By sucking the sap, they reduce the growth of the plant. *B. brassica* colonies cause leaf curl leaf discoloration, discoloration and growth retardation, and even death of infested plants (Ndiaye, M. 2017).

The intensification of market gardening activities, with the aim of increasing production, is a growing phenomenon in the urban and peri-urban areas of the South Kivu area. This has implications for the use of plant protection products as a means of crop protection (Frye, C. D. 2010). However, good agricultural practices related to their use are rarely respected, causing concern for the health of workers, consumers and the environment (Frye, C. D. 2010).

How does aphid affect cabbage in South Kivu province, specifically in the city of Bukavu? The knowledge of the incidence of ash aphids growing sprouts would be an asset to propose ways to fight against them. The aim of this research is to evaluate the incidence of *B. brassicae*on the cabbage (*Brassica oleracea*) in full growth. In addition, in the area study, no studies have been done on the incidence of aphids in growing cabbages.

2. STUDY AREA AND METHODS

2.1. Localization of the Environment

The study was carried out in the Democratic Republic of Congo, Province of South Kivu, in Bukavu city-Bagira, on the hill sheltering the Bwindi Institute, a school of the Community of Free Churches of Pentecost in Africa in the experimental fields of students of the Agricultural Technical Section. The geographical coordinates of the hill are as follows: 1500 m.a.s.l, 28 ° 50 'E and 2 ° 30' S. The map of the Bukavu city, including the district of Bagira is illustrated in the figure 1.

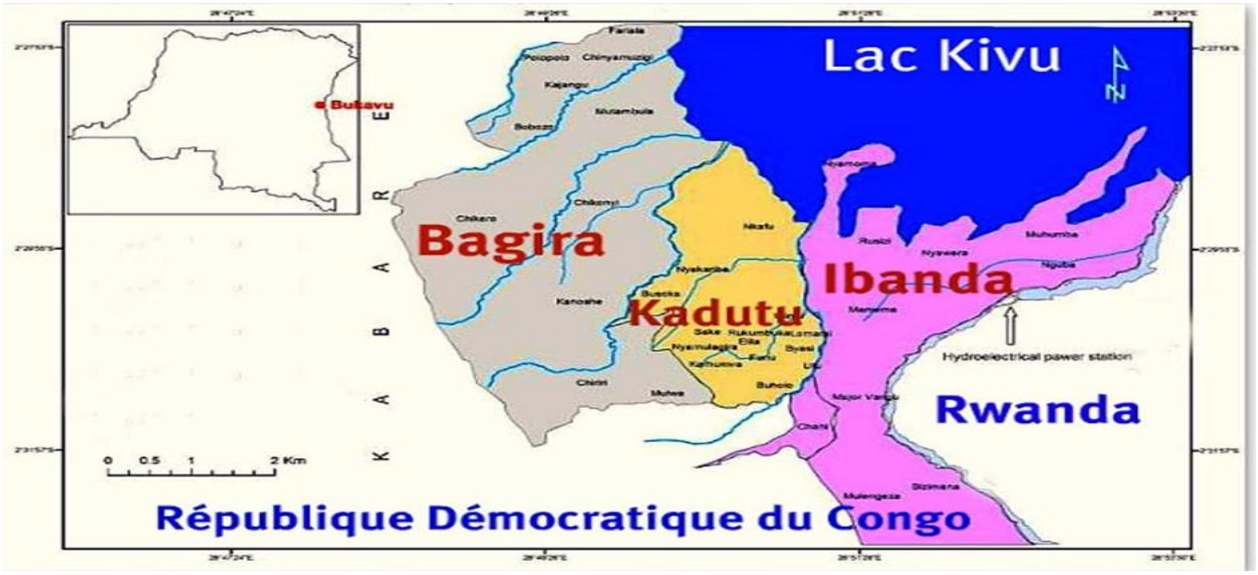

Fig1: Map of the area study: Bukavu city including the district of Bagira (pgkivu.blogspot.com, 2019)

2.2. Equipment

The material used is the cabbage (*Brassica oleracea var capitata*), and the seeds came from Agro-pastoral pharmacy in Bukavu.

2.3. METHODS

After sprouting, the cabbages were transplanted on 33 plots. Each plot has8 meters of long and 1.5 mof wide, ie. 12 $m^2$of average that were previously well plowed. Transplanting took place on october 2nd, 2018. Each plot had an average of 28 cabbage plants spaced 40 cm x 60 cm apart. The data collection took place on november 28th, 2018 and consisted in counting the seedlings sheltering the aphid colony per plot and calculating the incidence by the formula:

$(I)= \frac{\sum_{t-1}^{n} Pt}{N} x\ 100$, with Pt = Number of plants attacked at control period and N = Total number of plant per plot.

The data encoding was done on the computer using Microsoft Office Excel 2010 (Labou, B. *et al.*, 2014). The analysis consisted of the examination of the mean and standard deviation as well as graph.

3. RESULTS

3.1. Healthily and Attack Cabbages

The photos a_1, a_2 and a_3 illustrate healthily and *Brevicoryne brassicae* attack cabbage plants (Figure 2.1.) and b_1 presented healthy cabbage plant (Figure 2.2.)

Fig 2.2: Healthy cabbage plant

Fig 2.1: Aphids (*Brevicoryne brassicae*) attack cabbage

3.2. Results for cabbage plants

At least 8 (8.312 ± 5.089) cabbages plants per plotwere attacked by *Brevicoryne brassicae* against 14 (13.625 ± 4.133) healthy plants per plot. The most attack of *B. brassicae* cause considerable losses on cabbages at different plots as 8, 9, 10, 11, 12, 13 and 14 as shown in figure 3, below.

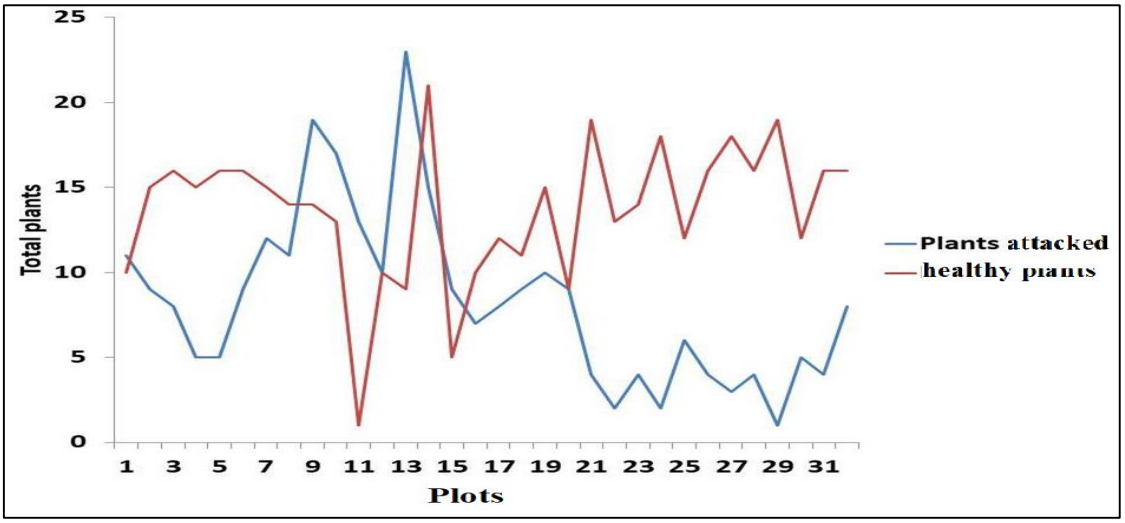

Fig 3: Total plants affected and healthy cabbage plants per plots

3.3. Results of the Incidence of Brevicoryne Brassicae per Plot

Table 1 shows the incidence of aphid attacks on cabbages per plots

Table 1: Incidence of *Brevicoryne brassicae* attacked

Plots	*Brevicoryne brassicae* attacked	Total	Incidence per plots (%)
1	11	21	52,380
2	9	23	39,130
3	8	24	33,333
4	5	20	25,000
5	5	21	23,809
6	9	25	36,000
7	12	27	44,444
8	11	25	44,000
9	19	33	57,576
10	17	30	56,667
11	13	14	92,857
12	10	20	50,000
13	23	32	71,875
14	15	36	41,667
15	9	14	64,286
16	7	17	41,176
17	8	20	40,000
18	9	20	45,000
19	10	25	40,000
20	9	18	50,000
21	4	23	17,391
22	2	15	13,333
23	4	18	22,222
24	2	20	10,000
25	6	18	33,333
26	4	20	20,000
27	3	21	14,286
29	4	20	20,000
30	1	20	5,000
31	5	17	29,412
32	4	20	20,000
33	8	24	33,333

This table 1 shows the most different*Brevicoryne brassicae*attack per plot: 1 (52,391%), 9 (57,576%), 10 (56,667%), 11 (92,857%), 13 (71,875%) and 15 (64,286%), and those with (50%)

respectively are 12 and 20. The remaining ones have a percentage of attacked between 5 to 45%. Average incidence is 37,109% and maximum of 92,857% and minimum of 5%.

4. DISCUSSION

4.1. Discussion of Affected and Healthy Cabbage Plants

Brevicoryne brassicae attacked 8(8.312 ± 5.089) cabbages per plots against 14 (13.625 ± 4.133) healthy cabbages per plot. The most affected plots are 8, 9, 12, 4, 10.This result joined the research of Walangululu and Mushagalusa in (2000), who confirm the presence of ashy cabbage aphids in Bukavu and surrounding areas. However, a study on the cultural association between cabbage (*Brassica oleracea L.*) and tropical basil (*Ocimum gratissimum* L.) shows a significant difference in the number of cabbage pests in favor of mixed crops (Vincent, M. 2016). The effect of tropical basil was most noticeable for cabbage borers, *H. undalis*, while for lepidopteran pests, *P. xylostella* and *Spodoptera littoralis* B., this effect was not observed (Vincent, M. 2016). Similarly, another study in Zimbabwe shows the prevalence of cabbage pests (*Bemisia tabaci* G., and *B. brassicae*) was significantly lower in cultural association with garlic or onion (Walangululu, J.M., & Mushagalusa, G.N. 2000).

4.2. Discussion of the Incidence

The most affected plots are 1 (52,391%), 9 (57,576%), 10 (56,667%), 11 (92,857%), 13 (71,875%) and 15 (64,286%), and those with 50% respectively are 12 and 20. Walangululu and Mushagalusa in 2000 (Walangululu, J.M., & Mushagalusa, G.N. 2000) severe attack of ash aphids cabbage, they could significantly reduce yield. For our case, we have 8 cabbages attacked / 12 m^2 then, the average cabbages attacked per hectare in our study are 6666, 6. Cochard *et al.*,. in (2012) had demonstrated that the presence of the colonies of *Brevicoryne brassicae* could cause a significant fall in the yields especially if the colony is important and the heart of the plant is reached when they set the threshold of economic harm to 110-120 cabbages reached per hectare. It is necessary to define the biological threshold of nuisance and the economic threshold which could affect the yield (Cochard *et al.*,. in 2012).The remaining ones have a percentage of attacked between 5 to 45%. Average incidence is 37,109% and 92,857% of maximum) and 5 %of minimum. Several authors (Walangululu, J.M., & Mushagalusa, G.N. 2000)), (FAO, 2010) and (Vincent, M. 2016) show in case of insects attack at the heart of the plant there is no formation of the cabbage but, the lesser damage attacks considered, there is a reduction of the market value of cabbages when those insects suck the sap of the plant, which is still a danger to the plant. Walangululu and Mushagalusa in (2000) attested the presence of these aphids, *Brevicoryne brassicae* in the province of South Kivu; this may also explain the fewer yields of cabbages and other problems of cabbage growers. This is the consequence of more dependence of South Kivu people on vegetable with Rwanda Republic.

5. CONCLUSION

Vegetables are an important part of the income of many Congolese farmers. However, the production of cabbages can be hampered by many pests.*Brevicoryne brassicae* aphid can cause enormous damage if no intervention is planned. The aim of this study was to demonstrate the impact this pest on cabbage growing in order to make a decision regarding the control of this insect based on the economic losses and thresholds of this insect on cabbages. At the end of this research, it should be noted that the *B.brassicae* are present in our area study and their colonies on cabbages can cause losses to producers when it is encountered on the leaves or if the heart of the plant is damaged. This is the case in our field. It is recommended that producers and other agricultural researchers consider an effective control of these insects to allow good production and to ensure a good yield of this crop. The fight against these insects*B. brassicae* should be done respecting the environment with ecological means.

Acknowledgements

We thank everyone who has contributed in any form for the realization of this work. Our thanks go especially to the students of the Agricultural Technical Section of the Bwindi Institute for their participation in the realization of this work.

Authors' Contributions

N. Byamungu participated in the design of the study, conducted the experiments. N. Byamungu, JA. K. Rubaburaand E.B. Bisimwaprepared the manuscript, and performed the statistical study. N. Byamungu, JA. K. Rubaburaand E.B. Bisimwahelped to improve this paper. N. Byamungu, contributed to this study design. All authors read and approved the final manuscript.

REFERENCES

1. FAO, Développer les villes plus vertes en République Démocratique du Congo. (2010) Ed. Viale delle Terme di Caracalla, 00153 Rome (Italie),.
2. Cochard, L., Larrieu, G., & Estorgues, V. (2012). Pucerons et chenilles sur chou-fleur d'hiver, Chambre d'Agriculture Paris/France ,(4).
3. Vumba, M. B. Kasanda, M., & Nkulu, (2015). Production des cultures maraichères à Lubumbashi: analyse comparative de la rentabilité de chou pommé et chou de chine. International Journal of Innovation and Scientific Research., 1(14), 55-61.
4. Walangululu, J.M., & Mushagalusa, G.N. (2000). Principaux ravageurs des choux pommés *(Brassica oleracea* var*capitata subs abouda*) à Bukavu et ses environs, Tropiculture, 18 (2), 55-57.

5. AUMN, Manuel de bonnes pratiques phytosanitaires pour la culture du chou pommé
6. Hervé, Y., Olivier, L., & Chauvet, M. (1993). Les choux. Ed. Sauve qui peut! n°6-7, Route de Saint, 35042 Rennes France, 7.
7. Ndiaye, M. (2017). Manuel sur les principaux ravageurs et maladies des cultures maraîchères dans la zone des Niayes. DPV, Ministère de l'agriculture, Dakar, Sénégal.
8. Wade, S.C. (2003). L'utilisation des pesticides dans l'agriculture périurbaine et son impact sur l'environnement).
9. Yarou, B.B., Assogba Komlan, F., Tossou, E., Mensah, A.C., Simon, S., Verheggen, J.F., & Francis, F. (2017). Efficacy of Basil-Cabbage intercropping to control insect pests in Benin, West Africa. In press.
10. Frye, C. D. (2010). Microsoft Excel 2010, Sebastopol, Microsoft Press, coll. « Step by Step », 512.
11. Labou, B., Brévault, T., Niang Fall, A., & Diarra, K. (2014). La teigne du chou, *Plutella xylostella* (Lepidoptera, Plutellidae), ravageur clé dans la zone maraîchère des Niayes au Sénégal. UCAD, Dakar Sénégal.
12. Vincent, M. (2016). Evaluation de la nuisibilité de la mouche du chou *Delia radicum* L. sur Brassicaceae légumières pour mesurer l'impact du contrôle biologique. Ed. AgroParisTech Montpellier France, 70.
13. Debra, R. K., & Misheck, D. (2014). Onion (*Allium cepa*) and garlic (*Allium sativum*) as pest control intercrops in cabbage based intercrop systems in Zimbabwe. IOSR J Agric Vet Sci. 7, 13-17.