NTU Journal of Agricultural and Veterinary Science - (NTU-JAVS)
(P-ISSN: 2788-9890 e-ISSN: 2788-9904)

Inventorying The Most Common Broccoli Pest Insect and Assessing the Effectiveness of Sticky Traps in Reducing Damage

1st Batol A. Karso[1] 2nd Rasha yousif[2] 3rd Hozan Mustafa[3] 4th Dauod Mohammad[4]
Email: batool.karso@uod.ac
1. Collage of Agri. Eng. Scie / University of Duhok , Iraq
2 , 3 , 4 Agricultural Research Center / Duhok , Iraq
Received: 23-1-2022, **Accepted:** 28-2-2022, **Published online:** 17-5-2022

Abstract. Broccoli (*Brassica oleracea* L.) belongs to the family Brassicaceae, is a cool-season crop that can be grown year-round under controlled greenhouses conditions. And the results showed that the plant was attacked by many pests causing direct damage to the crops. As cabbage grey aphid (*Brevicoryne brassica* L.), cabbage white butterfly(*Pieris rapae*), great white butterfly (*Pieris brassicae*), diamondback moths (*Plutella xylostella*), cabbage cutworm(*Agrotis ipsilon*), and Grasshopper (Melanoplus sp.), and using sticky traps have been efficient in controlling the density of these pests and can be applied within the integrated pest management, so their use avoids damage to the crop. The traps were superior in reducing the insect's infected percentage to (4, 0,2,3,3,2)% respectively, as well as in the effect on the quantity and quality of the yields obtained, where the highest production was recorded, amounting to approximately 1200kg/greenhouse and the absence of the need to use chemical pesticides compared to the control (without traps), where the production reached 700 kg/ greenhouse.

Keywords: Broccoli, Stick traps, greenhouse pests.

Introduction

Broccoli (*Brassica oleracea* L.; Family: Brassicaceae), is one of the annual herbaceous plants belonging to the cruciferous family (Baidoo, and Mochia, 2016; Gyanoba, 2018). The height of the broccoli plant is about sixty cm. and it varies according to the variety of the broccoli plant (Mudzingwa, *et. al.*, 2013). The head of the broccoli plant is a cluster of flowering buds that forms a green head, the origin of it is the Mediterranean region, a vegetable that can withstand drought and cold. (Norman and Shealy, 2007)

The broccoli plant has many benefits (Nestle, 1998), as it strengthens the immune system; Because it contains selenium and zinc, it enhances liver functions, prevents cancer, and facilitates the work of the digestive system(Steinbrecher, and Linseisen,2009; and Baidoo, 2012). It contains a large amount of fiber, strengthens bones, Enhances the health of the heart and arteries, and contains a group of vitamins, such as vitamin C, vitamin A, vitamin K, and a group of elements, most important of which are iron, phosphorous, potassium, magnesium, calcium (Norman and Shealy, 2007).

The annual global production of broccoli is about 20.842.200 tons, and China is one of the world's largest producers of broccoli, with an annual production of approximately 9.030.990 tons. Egypt ranks tenth in broccoli production, and its annual production of broccoli reached 201.201 tons. (Orzo lek, *et. al.*, 2012). Broccoli is a cool-season crop that can be grown year-round under controlled conditions such as greenhouses. Brassicas crop suffers extensively from insect pests and is attacked by more than 25 insect pests. There is some common pest across the world. Others are region-specific, and some of them are active vectors of deadly diseases besides causing direct damage to crops. Aphids, mites,..etc. So the particular had devastating effects on the broccoli. Pests like cabbage butterflies, diamondback moths, and aphids. (Boopathi, 2012) which attack the *B. oleracea* crop at different growing stages, causing huge destruction to the cabbage crop during the growth stages (Baidoo, and Mochiah ,2016; Furlong, *et.al.*,2013; Timbilla, and Nyarko,2004) and lastly results in to huge yield losses in the field. Although *B. oleracea* production in Iraq country is practiced by a number of smallholder farmers, there is limited information on broccoli yield losses caused by insect pests in the field. The paper showed the major insect pests of economic importance infesting broccoli crops in Duhok province - Iraq and the role of sticky traps in broccoli pests control in the greenhouse

.

Materials and Methods

This study was carried out in a greenhouse of the agricultural research station in Duhok province of Iraq, weekly samples were conducted from fields of Broccoli plants during the agricultural season 2019-2020 by selecting ten plants of Broccoli, all samples were randomly from foliage parts and flowers. Also, sticky traps were used for monitoring the pests after seedlings in the greenhouse directly by putting ten traps for each greenhouse measuring 40*25 cm, which they suspended above the plants at a distance of twenty cm., which they suspended above the plants at a distance of twenty cm. the number of trapped adults was collected and recorded, then replaced with new traps applied for direct control.

The insects were identified naked eyes, in addition to symptoms on the foliage. Samples were examined in an entomological laboratory in the plant protection department by light microscope and identified according to previous classification keys (Baronstev, 1998), the samples were also classified by natural history museum \ Baghdad Univ., also calculating the percentage of infestation by insects on broccoli plants by using this equation (Arab, 2003).

$$\text{Infection\%} = \frac{\text{No.of infected plants}}{\text{Total No.of plants in the frame}} \times 100$$

Three greenhouses with an area of 22*10m were selected

Results and discussion

A- Broccolis Pest species:
During the field survey between 2019 and 2020, several different species of pests that infect and affect the quality and quantity of the broccoli crop with many different rates of infestation were collected and divided into two groups:
1- insects.
Insects caused a main probable problem in broccoli production, like flea beetles, cabbage loppers, cabbage worms, diamondback moths, and aphids all be able to cause crop losses. As below: (Table 1)
-Great white butterfly(GWB) *Pieris brassicae* L.
Lepidoptera: Pieridae
GWB adults, recognized overseas as the large white butterfly, is similar to small white butterfly (*P.rapae*), but it's bigger, with a wing-span of 50~68 mm. and differs in appearances in that the fore-wing of GWB has a large distinctive black tip. The egg is an egg-shaped shape sunny yellow color and color be orange former to hatching. The larva is olive-green in color with a distinct yellow dorsal stripe, each lateral has dark spots. The body covering by fine, many hairs are black and bear above tubercles, with shiny blackheads. generality larvae feed and stay together for most of their life. mature larvae leave host plants to locate a good place to pupation in the ground. Pupae are paly green and 20mm in length and are spotted with deep yellow marks. This insect species has a seasonal aestivation and overwintering stage in the cold season.
Damage: GWB is observed as a dangerous pest of broccoli, cauliflower, and cabbage. The injury stage is a larva. on the leaves, the caterpillars stay as groups after hatching, and they grow and they making big holes in leaves. And they damage growing tips and whole plants, especially large caterpillars, if not controlled.
-Greasy cutworm (GC.)
Agrotis ipsilon Hufn.
Lepidoptera, Noctuidae
The moths of GC. are strong, dappled tan to grey, and it has large black spaces on the thorax and fore-wings. The forewings are tall and thin extended of roughly forty-five mm. activate at night and through day hide among plants. Each female laid 600-800 eggs as singly or masses randomly on plants foliar or the soil. The color of the egg is white when laid but changed to bright tan their diameter is about 1 mm. New caterpillars are grey-brown, and immature instar is dark-grey with 2 dark yellow longitudinal lines. The larva has 4 pairs of pro-legs on the middle abdomen. Mature caterpillars, up to fifteen mm lengthy, to pupate make a terrestrial cubby in the top fifteen mm of the earth, below some covering plants.
Damage: The greasy cutworm larvae cut fresh stems close to or just under the surface's ground soil. It is more communal in skinny terrestrial, including pasture, and they can be caused problems when this terrestrial is recycled for novel yields.
-Small white butterfly(SWB) *Pieris rapae* L.
Lepidoptera, Pieridae
The SWB adult has a grey-black,,body length was twenty mm with 4 white wide wings with dark black patches, adults were day-light flying, mostly during the hot sunny climate. Female laying three hundred-four hundred eggs bullet-shaped eggs, which are yellow to orange. Caterpillars are pale green and have thin hairs that give a look as velvety, and be two-three mm in length. A mature caterpillar attaches itself to the underside of leaves and changes into cocoons near twenty mm in length to develop to the pupal stage.
Damages: small larvae staying on the under-side of the leaves after hatching eggs, thereafter chew great unequal holes in the leaves. big amounts of

larval dung, large larvae may damage broccoli heads.

-Diamondback moth (*plutella xylostella* L.) (*P. maculipennis* Curt)

Lepidoptera, Yponomeutidae

It is called cabbage moths because they lay their eggs mostly on the family of cabbage crops. In spring the moths start to lay eggs that hatch into very small-green caterpillars with cleft-tails. The caterpillar's length is lesser than half-inch with creamy heads and feet. (Gyanoba, 2018)

Damage: Caterpillars scrape holes in broccoli leaves that gradually increased in size to give leaves a window-pane look. The caterpillars are set generally on leaf undersides. (Furlong, *et.al*., 2013)

-Grasshoppers *Melanoplus sp.*

Orthopter, Acrididae

This pest has strong, long hind legs that enable it to hurdle- large distances. most grass-hoppers that harm gardens, color varies with species are black, green, or tan,

Damage: Grass-hoppers biting-chew big-holes in leaves. When populations density is high, they can devour, and destroy garden plants.

Cabbage grey aphid(CGA), *Brevicoryne brassica* L.

Homoptera, Aphididae

CGA. is about two millimeters lengthy, cloudy green to grey color, and be from heavy groups which are wrapped with a pale-white waxen power. The adult females could give birth during the year to live progeny. All nymphs, winged, wingless adults occur in colonies. Adults of winged forms are grey-green with black markings on the body and do not have the waxy coating characteristic of other individuals of the species. Their very short, barrel-shaped cornicles (two small upright projections from the rear of the body) and general body form distinguish them from peach green aphids.

Damage: cabbage grey aphids feed by sucking up fluids of plants, causing yellowing, wilting, and curling of leaves. Heavy colonies may be seen around the plan's fresher leaves and flowering parts. Cabbage grey aphids translate the mosaic virus of cauliflower, the mosaic virus of Turnip, and the Turnipyellows virus. (Mudzingwa, *et.al.*, 2013)

Cabbage whitefly *Aleyrodes proletella* L.

Homoptera, Aleyrodidae

The adult cabbage whiteflies are 1.3-1.5 millimeters lengthy, wings covered in snowy, waxy dust. An adult lays their small eggs as a mass on the bottom of the leaves, where feeding. The length of the larva (1st instar) is about 0.3 millimeters, flat-oval shaped, while 2,3, and 4th instars form a puparium.

Damage: Whitefly is piercing-sucking fluid feeders, but heavy infestation cause to weakening of the host plants is unusual. The extra typical harm by sooty−moulds that grown in the honey−dew that is secreting due to the white−fly (larva &adult).

2- Non insects pest.

Grey field slug

Deroceras panormitanum

The grey field slug is well-known master pest species of vegetal brassicas. Slug laying their eggs in the ground which are hatched to be young, they eat decomposing vegetable matter. mature individuals are fed on plants. Slugs are nightly active, found in moist conditions.

Damage: slugs feed on the stems of broccoli and leaves, infected plants are exposed to infestation by fungal and bacterial diseases.

B/ Field infestation and role of sticky traps in controlling broccoli pest:

Table (1) shows the results of fieldwork, as it showed the superiority of the white sticky traps in recording the lowest percentage of insect infestation on the broccoli crop, which amounted to the white butterfly (*Pieris rapae*) zero%and the Grasshopper (*Melanoplus sp.*) 2% followed by the Great white butterfly (*P. brassicae*), Greasy cut-worm (*Agrotis ipsilon*), Diamondback moth (*patella xylostella*) and the cabbage grey aphid (*Brevicoryne brassicas*), it amounted to 2.3, 3.0, and 4.0%, respectively, and the highest percentage of infestation was recorded on the cabbage whitefly, which was 10%. The difference was significant and clear compared to the control comparison (greenhouses without sticky traps), which recorded the highest rate of cabbage whitefly infestation, which amounted to 60%, followed by infection with cabbage aphid reached 56%, and the lowest rate percentage of infection recorded when infected with Grasshopper, which amounted to 28.12%. as for the non-insect pests, the presence of some types of snails was observed at a rate ranging between 15 and 15.15% for both types of greenhouses containing sticky traps and without traps, respectively, because they can't be attracted to sticky traps.

These traps have proven their efficiency in eliminating insect pests, so they can be applied within the elements of integrated pest management. Taking care to apply these traps within the various integrated management elements avoids damage to the crop. It is also clear that the effect of the trap was significant and superior in monitoring and recording the first appearance of the insect's pest, as well as in controlling insects pests in greenhouses compared to others without sticky traps, where the highest broccoli production was recorded about 1200 kg/greenhouse and in addition to the lack of need for chemical pesticides used for pest control

compared to the control treatment (without traps) which the broccoli production amounted to each greenhouse is 700 kg, this agreed with Nancy, et.al.(2008) when they pointed out the efficiency of adhesive traps in insect control.

Table 1. Efficacy of using sticky traps in % infestation on the broccoli crops in the greenhouse.

No.	Name of pests	%infestation with sticky traps	%infestation without sticky traps
1	Cabbage grey aphid (*Brevicoryne brassicas*)	4	56
2	White butterfly (*Pieris rapae* L.)	0	55.5
3	Great white butterfly (*Pieris brassicae*L.)	2	45
4	Greasy cutworm (Agrotis ipsilon)	3	30
5	Diamondback moth (*Plutella xylostella*)	3	33.3
6	Grasshopper (Melanoplus sp.)	2	28.12
7	Cabbage whitefly (*Aleyrodes proletella*)	10	60.1
8	Slugs	15	15.15

Conclusion

1-The broccoli crop is infected with many insect pests, such as cabbage grey aphid, cabbage white butterfly, great white butterfly, diamondback moths, and cabbage cutworm. And sticky traps have the main role in controlling, reducing the population density of pest insects.

Recommendations

Sticky traps can be used to predict the emergence of insect pests, benefit from them in pest control and reduce the use of chemical control to control them and thus preserve the environment..

Acknowledgment

The authors are very grateful to the University of Duhok / College of Agricultural engineering science and Agricultural Research Center for their assistance to improve the quality of this work..

References

[1] Baidoo, P.; Mochiah, M.(2016). Comparing the effectiveness of garlic (*Allium sativum* L.) and hot pepper (*Capsicum frutescens* L.) in the management of the major pests of cabbage Brassica oleracea (L.). Sustain. Agric. Res.5, 83–91.

[2] Boopathi,T., K.A. Pathak,(2012). Seasonal Abundance of Insect Pests of Broccoli in North Eastern Hill Region of India. Madras Agric. Journal , 99 (-3): 125-127.

[3] Gyanoba, M.S.C.(2018). Bio-Efficacy of Newer Insecticides against Diamondback Moth (*Plutella xylostella* L.) and Their Residues in Cabbage; Mahatma Phule Krishi Vidyapeeth Rahuri: Maharashtra, India.

[4] Mudzingwa, S.; Muzemu, S.; Chitamba, J.,(2013). Pesticidal efficacy of crude aqueous extracts of *Tephrosia vogelii* L., *Allium sativum* L. and *Solanum incanum* L. in controlling aphids (*Brevicoryne brassicae* L.) in rape (*Brassica napus* L.) n controlling aphids (Brevicoryne brassicae L.) in rape (*Brassica napus* L.). Journal of Agricultural Research, 2: 157–163.

[5] Norman, C.; Shealy, M.(2007). Illustrated Encyclopedia of Healing Remedies; Elements Book Inc.: Toledo, OH, USA.

[6] Orzolek, M. D. ; William J. Lamont Jr.; Lynn F. Kime, and Jayson K. Harper (2012). *Pennsylvania Commercial Vegetable Production Guide.* University Park: Penn State College of Agricultural Sciences, 18-29 pp.

[7] Steinbrecher, A.; Linseisen, J. (2009).Dietary intake of individual glucosinolates in participants of the EPIC-Heidelberg cohort study. Annals of Nutrition Metabolism, 54: 87–96.

[8] Kusznierewicz, B.; Bartoszek, A.; Wolska, L.; Drzewiecki, J.; Gorinstein, S.; Namie´snik,and J. Partial.(2008). characterization of white cabbages (Brassica oleracea var. capitata f. alba) from different regions by glucosinolates, bioactive compounds, total antioxidant activities and proteins. LWT Food Science and Technology, 41: 1–9.

[9] Baidoo, P.,and Adam, J.(2012). The Effects of Extracts of *Lantana camara* (L.) and *Azadirachta indica* (A. Juss) on the Population Dynamics of Plutella xylostella, *Brevicoryne brassicae* and *Hellula undalis* on Cabbage. Sustainable Agriculture Research,229–234.

[10] Furlong, M.J.; Wright, D.J.; Dosdall, L.M.(2013). Diamondback moth ecology and management: Problems, progress, and prospects. *Annual review* of *entomology*, 58: 517–541.

[11] Timbilla, J.,and Nyarko, K..(2004) A survey of cabbage production and constraints in Ghana. Ghana Journal of Agricultural Science, 37: 93–101.

[12] NESTLE, M.;(1998). Broccoli sprouts in cancer prevention. Nutrition Review. 56:127-130