ISSN 2582-788X RESEARCH ARTICLE

INTERNATIONAL JOURNAL OF
APPLIED CHEMICAL AND BIOLOGICAL SCIENCES

POTENTIAL OF TRAP CROPS FOR MANAGEMENT POPULATION OF TOBACCO APHID (*MYZUS NICOTIANA L.)*

Abebe D.* and Tadesse M.

National Tobacco Enterprise (Ethiopia) SC, Ethiopia

ABSTRACT

Tobacco aphid (*Myzus nicotiana L.*), is the primary insect pest of tobacco crop in Bilate tobacco farm. At farm level control of pest rely on insecticide application on the entire field, but surrounding main crop with a more attractive trap crop could reduce reliance on insecticides .A field trail was conducted in 2015 dry and wet seasons at Bilate tobacco leaf development farm to select the potential and an effective trap crop to control *Myzus nicotiana L.* Three potential crops and no trap crop (control) included in the trial. The result confirmed that using maize crop as trap (border) reduce aphid population planted before main crop. These results suggest that used maize crop as trap (barrier) effect and simple enough in its implementation to have high potential for adoption by farm.

Keywords: Bilate, trap crop, tobacco aphid, yellow trap, maize.

1. INTRODUCTION

Tobacco aphid (*Myzus nicotiana*), is the primary insect pest of tobacco crop in Bilate tobacco leaf development farm. *Myzus nicotiana* colonize and feeding tobacco seedlings in the nursery in high populations that reduce plant vigor, and they may be carried to the field reduce leaf quality and transmit bushy top virus disease. Yield losses from bushy top virus disease high in tobacco at Bilate, necessitating the development of control methods that reduce transmission of bushy top disease during the most susceptible stages of plant development. High aphid populations can reduce tobacco yield by 22 to 28 percent. Aphids deposit honeydew on tobacco leaves, and even dark, sooty mold often develops. This interferes with curing and reduces quality. The presence of sooty mold indicates that aphids have been a problem, but these materials often remain on leaves after aphids have been controlled. *M. nicotiana* is generally distributed wherever tobacco is grown and is favored by a relative warm and moist climate, especially in the tropics [1].

Several sustainable methods of control have been developed in recent years for reducing pest damage in field vegetable crops. As a result, more selective insecticides are now being introduced into crop production. This has helped to overcome some of the problems that occur when pest insects develop resistance to certain insecticides [2, 3].

Irrational use of pesticides in Agricultural production has lead to serious problem and in some crops, like paddy rice in Asia , the cost of pesticides use are already higher than the benefit [4]. Problems with

the use of pesticides are usually worse in developing countries where many production of the WHO 'category I' are still used. Those production being highly or even extremely toxic [5] lead to considerable amount of poisoned. Some sources have reported up to 25,000,000 cases per year [6].

For these reasons, alternative approaches to pest control are used more and more and the concept of integrated control to all classes of pest and was expanded to included tactics other than just chemical and biological control. Mechanical methods are the first option to consider. They included tarp crop, hand picking, erecting insect barriers, vacuuming and tillage to disrupt breeding [7]. Earlier work has shown that trap crops are sustainable control method for tobacco aphid [8, 9].

Currently, chemical control management practice for this pest face issue related to rising cost, potential for developing resistance to *M. nicotiana*, environmental concern , human health impact and injury to beneficial insect species, pesticide contamination tobacco. These results lead in a shift to alternative management strategies, namely biological control for insect pest. Trap crop is a control of in which plants are deployed to attract intercept, retain and/or reduced targeted insect or the pathogens they vector in order to reduce damage to the cash crop [10]. The effectiveness of any trap crop system depends on interplay between the spatial arrangement of the trap crop system and pest population, such as movement and reproduction [11].

Different trials conducted to control aphid species on Chill, Papaya, Tomato, tobacco and Bean crops managed by trap crop such as intercropping chilli with maize or brinijal to control aphid gossypill [12], to controll papaya ring spot virues (PRSV) [13], to controll tomato yellow leaf curl [14] and corn as barrier and eggplant as a trap crop for control of *Bemisia argentifolii* [15]. This fact brought the need for looking into different trap crops for Bilate tobacco farm at which *M. nicotiana* infestation and damage is minimal. Even though, in tobacco farms aphid in general was regarded as important and traps control method not known. Hence, the present studies proposed with objective of selecting an effective trap crop for managing tobacco aphid.

2. MATERIALS AND METHODS

2.1. Sample collection

The trial was conducted in field for two seasons 2015 in dry and wet crop growing season which belongs to the Bilate tobacco research farm site, which located in Southern Nations Nationalities and Peoples (SNNPR) regional State, Ethiopia. Three potential trap crops were identified as treatments from different crop families, these were: Zea- May (Maize), Heianthus annuus (Sunflower), Carthamus tirctorius (Safflower), no border crop as a check. K-110 tobacco variety was planted to detect the potential of trap crop.

2.2. Experiment

Design of the experiment was Randomized complete block design (RCBD), with three replications, producing twelve plots. Four rows of tobacco 5 plants /row and two rows of trap crop (totally eight) were planted in all sides, and tobacco only in control plot. Adjacent plot separated by ten meters from south to north and east to west. The plot and trap crops barred with a 1.0 m stripe. Two rows of attractive trap crop at each side planted two weeks before transplanting the tobacco seedling. In each plot, after one month yellow water traps monitoring made of plastic bowls (40cm*60cm) was placed in the middle of main crop to trapped adult aphid. The trap filled with water, the number of Aphid trapped in each trap counted at 10 days interval 5 times. Dry (short rain season) yellow trap placed mid of January,

Table 1. Climatological data during the trapped season in Bilatie tobacco farm

Month	Precipitation(mm)		Average Temperature (°C)	
	Dry	LT*	Dry	LT*
Jan-15	0	21	24.8	25.2
February	0.8	24	26.4	25.43
March	48	51	26.5	25.65
Annual total /average	**48.8**	**96**	**25.9**	**25.4**
June	70.2	70	23.6	22.65
July	149.7	79	23.1	22.19
August	27.7	80	24.05	22.44
Annual total /average	**247.6**	**229**	**23.6**	**22.43**

*LT - long term average

aphid counted started end of January (25/01/15) extended to mid-march (13/03/15). Similarly, at wet (main rainy season) yellow trap placed end of May, aphid counted started early of June (05/06/15) continued extensively at10 days intervals 5 times extended to mid-July (15/07/15. Fertilizer application for the trap crops and tobacco were 100 kg ha -1 NPS recently introduce fertilizer having 38% P2O2, 19% Nitrogen and 7% sulfur applied at planting and urea source of nitrogen also applied at first weeding. Monthly data recording period rainfall and average temperature information was obtained from the Bilate station. Data was analyzed using was analyzed using analysis system [16].

3. RESULTS AND DISCUSSION

3.1. Experimental site

The experiment conducted in long and short rain seasons. The amount of precipitation was high in wet (June, July and August) and low in dry (January, February and March) in the long term average (2004-2010) than during trial period, while average of temperature in long term average and trial period not big difference was observed in both seasons (Table 1) . The soils of the trial plot were loamy, with alkaline reaction (PH 7.4), low in organic matter and available nitrogen and moderate available phosphorus and potassium [17].

3.2. Mean Population of aphid on yellow trap

Total numbers of adult aphid trapped by yellow trap during crop development stages of trap crop were low in dry season (237) when comared in rainy season (375)adult aphid/trap (Table 2). Thus different number was observed might be due to variation of wet and dry temperature, humidity and rainfall. Our result data described, monitoring aphid population counted was made in 2012 and 2013 at Bilate nursery and field, aphid peak population counted in the week of 2 and decline to zero in third week and from week 18, the population was increasing until week 21. After 21st week the population was reduced to zero and remained the same till week 43 [18].

Among tested trap crops, Zea-may (maize) and Carthamus tinctorius (safflower) showed very

Table 2. Trap crops used to trap mean adult aphid count/yellow trap in dry and wet season

	Maize	Sunflower	Safflower	Tobacco	Total Count
			Dry		
Total	44	83	51	59	237
Mean± SE	8.59 ± 1.12^{ab}	13.8 ± 1.92^{a}	7.33 ± 1.4^{b}	9.83 ± 1.49^{ab}	-
			Wet		
Total	34	122	70	149	375
Mean± SE	6.80 ± 3.15^{b}	24 ± 4.37^{a}	14 ± 3.15^{b}	29.8 ± 7.34^{a}	-

Means within the same row followed by the difference letters are statistically different at p <0.05 level

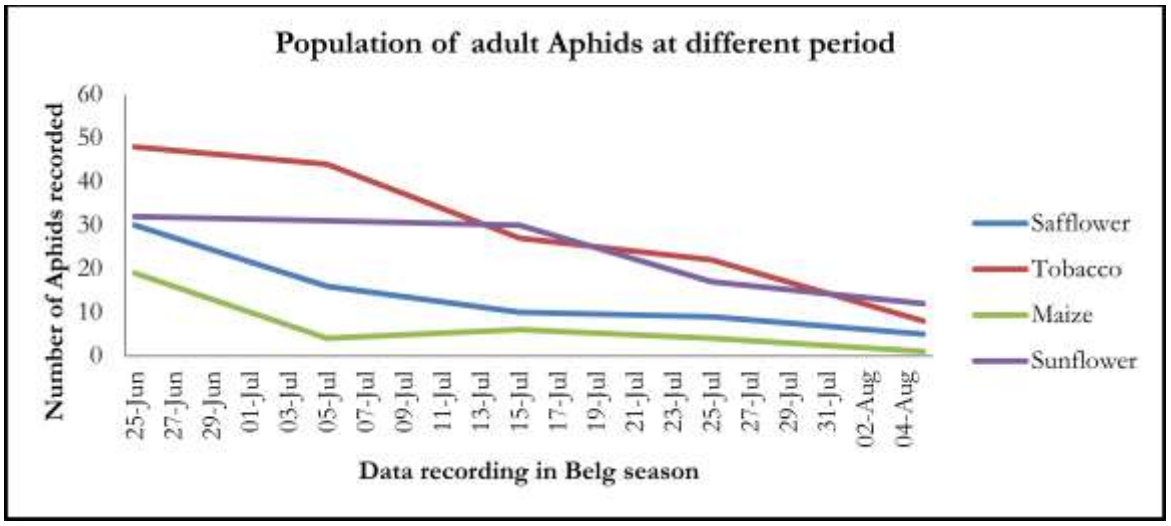

Fig 1. Population of adult Aphids (*M. nicotiana*) on different trap crops in wet season

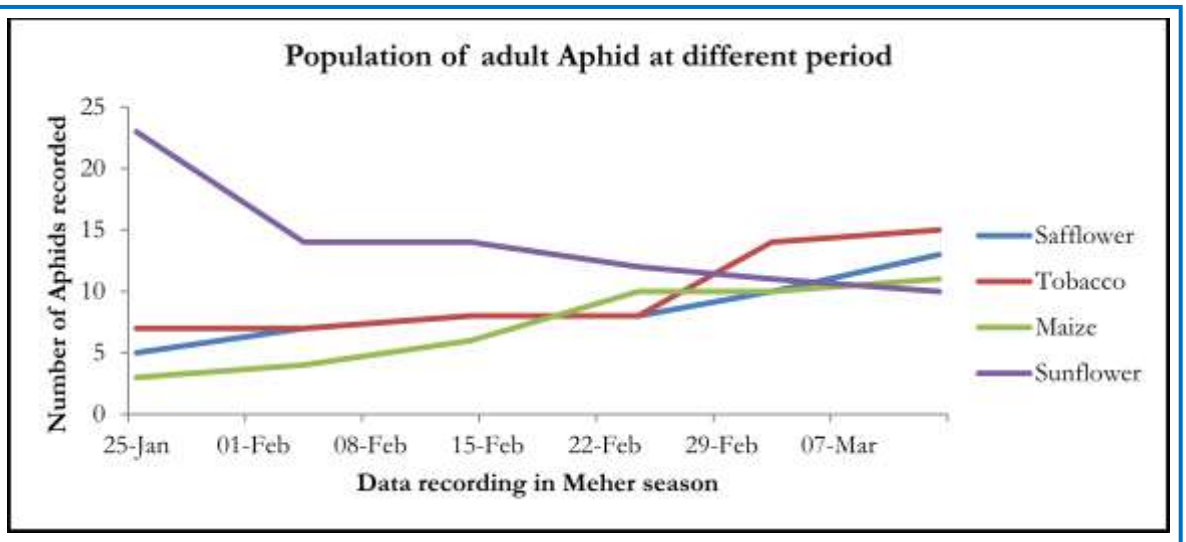

Fig 2. Population of adult Aphids (*M. nicotiana*) on different trap crops in dry season

remarkable reduction in aphid counted in yellow trap than Heianthus annuus (sunflower) and control both season (Table 2). Among the three trap crops and check tobacco, in dry and wet season, the mean numbers of adult *M. nicotiana* were reduced in number on maize 1.12± 8.59 and 3.15±6.80, followed by safflower 1.4±7.33 and 3.15±14. On the other hand, mean adult aphids trapped by yellow trap on sunflower was 1.92±13.8 and 1.92 ±24 in control was 1.49±9.83 and 7.34 ±29.8 high in dry and wet season respectively. An effective trap crop must be significantly attractive to an insect pest and reduced number of aphid trapped by yellow trap. Therefore, our study indicates that maize is an ineffective trap crop to attract aphid in tobacco growing period. These results support previous work indicate that using as trap crop maize in reducing for control aphid species of different crop [19-21].

3.3. Number of aphid trapped on yellow trap

The trapped aphid increment in dry and wet season's results on traps and main crop recorded period presented (Figure 1 and 2). The results indicated that the population of Aphid on sunflower plots in yellow trap was increased during early stage of growing period. While , less aphid number were recorded just after flowering of sunflower; lately in wet and

dry season respectively season due to delay flowering. On the other hand, the mean population of matured aphid trapped on yellow traps increased for maize, safflower and tobacco. Vegetative growth and succulence of leaves was at its peak at early period of development and data showed that pest population decreased toward the crop end of vegetative period, started lost green color and matured in both season.

4. CONCLUSION

Current our study showed that maize crop attracts more tobacco aphid. Therefore, we recommend maize as trap crop as border plant & may be the cheapest and effective means of controlling tobacco aphid in tobacco production. In addition, the trap crop on advantage for the farmers as consumption grain harvested from trap crops planted and better tobacco yield was also harvested because of lesser infestation tobacco aphid. Thus, optimum control of tobacco aphid by means of trap crops is by far the most economical method to be practiced by small – scale tobacco growers farm and Enterprise field in Bilate, Ethiopia.

5. ACKNOWLEDGEMENT

I want to thanks Mr. Mekonnen Tadesse and Tamart Bati for data collection and field management.

6. CONFLICT OF INTEREST

The authors have declared that there is no conflict of interest.

7. SOURCE/S OF FUNDING

No source of funding

8. REFERENCES

1. Dixon, AFG (1985), Aphid Ecology, Blackie and Son Ltd, Bishopsbriggs, Glasgow.

2. Martin, NA, Workman, PJ, Butler, RC (2003), Insecticide resistance in onion thrips (Thrips tabaci) (thysanoptera: Thripidae). NZ J. *Crop Horticulture Science*: **31**, 99-106.

3. Rueda, A, Shelton, AM (2003), Development of a bioassay system for monitoring susceptibility in thrips tabaci, *Pest Management science*; **59**, 553-558

4. Rola, ACY, and Pinpall, PC (1993), Pesticide, rice production and farmer's health; IRRI, Manila/Philippines.

5. WHO (1992), WHO hazard classification, WHO/PCS/92.14;WHO,Geneva/Switzerland.

6. Knirsch, J (1994), Gift beutel furdie Dritte Welt Globus, No.4/1994, Frankfurt main/Germany

7. Benett, GW, Owens, JM, Corngan, RM (2005), scientific guide to pest management operation, **6th** edition pages 10:11-12, Purduw University, Questes.

8. Jayanth, PD, Padmarathamma, K (2001), Joint action of microbial and chemical, *Journal of American Society of Horticultural Science*; **116 (3)**:416-420.

9. Zhou, X.M. and Hung, B.Q (2002). Insecticide resistance of the common cut worm (argotic spp) and its control strategies. *Entomological knowledge*; **39**, 98-102.

10. Shelton A.M. and Badenes-Perez, F.R (2006), Concept and application of trap cropping in pest management. *Annual Review of Entomology*; **51**: 285-309.

11. Hokkanen, H.M.T. (1991), Trap cropping in pest management, *Annual review of Entomology*; **36**:119-138.

12. Hussein, MY and Samad, NA (1993), Intercropping chilli with maize or brinjal to suppress populations of Aphid gossypii Glov, and transmission of chilli viruses. *Int. Journal of Pest Management*; **39**:216–22.

13. Gonsalves, D (1998), Control of papaya ring spot virus in papaya: a case study. *Annu. Rev. Phytopathol*: **36**:415–437.

14. Al-Musa, A (1982), Incidence, economic importance, and control of tomato yellow leaf curl in Jordan. *Plant Dis*; **66**:561–63.

15. Smith, HA and McSorley, R (2000), Potential of field corn as a barrier crop and eggplant as a trap crop for management of Bemisia argentifolii (Homoptera: Aleyrodidae) on common bean in North Florida.Fla. *Entomol*; **83:**145–58

16. SAS Institute Inc, (1988). SAS/ STAT User's Guide, Release 6.03 Edn., Cary, NC: SAS Institute Inc.

17. Landon, JR (1991), Booker tropical soil manual: A handbook for soil survey and agricultural land evaluation in the tropics and subtropics. *Longman Scientific and Technical*, Essex, New York; 474p.

18. Baye, M, Taye, S, Mekonnen, T and Mesfin, S (2013), monitoring aphid population, tobacco reserch report, Addis Ababa, Decamber, 2013.

19. Keeping, MG, Rutherforal, RS and Conlong, DE (2002), Bt- maize as a potential trap crop for management of Eldana saccharina walker (Lep, pyralidae), *Journal applied entomolgy*;**131(4)**, 241-250.

20. Cochereau, P (1980), The sugar cane African borer Eldana saccharina Walker (Lepidoptera, Pyralidae, Gelenchiinae): studies on populations and parasites. *Int. Soc. Sug. Tech. Entomol. News;* **8**, 6–7.

21. Teulon, DAT, Stukens, MAU and Fletcher, JD (2004), Crop infestation by aphid is related to flight activity New Zealand detected with 7.5 m high suction traps. *New zeland plant protection*, **57**:227-232.