International Multidisciplinary Research Journal 2013, 3(2):23-26
ISSN: 2231-6302
Available Online: http://irjs.info/

INTERNATIONAL MULTIDISCIPLINARY RESEARCH JOURNAL

Effect of Weed Management on the Growth and Yield of Cucumber (*Cucumis sativus* L) Intercropped With Maize (*Zea mays* L) in Southeastern Nigeria

M.C. Mbah and N.L.Aniekwe*
Ebonyi State University, Abakaliki, Nigeria

Abstract
The problem of weeds in an agro-ecosystem is enormous; causing yield losses in crops and great financial demands controlling them with manual labour and/ or herbicides, hence the trial of a low cost cultural approach. Field trials were conducted in 2009 and 2010 to evaluate the effect of weed management void of bioterrorism and environmental disturbances on the growth and yield of cucumber and maize in Abakaliki, located at latitude 06o 19' 407" N, longitude 08o 7' 831'E, at an altitude of 447m above sea level, with annual rainfall of 1700mm-2060mm, spread mainly between April and October. The experiment was a 3x2 factorial in a randomized complete block design (RCBD), in four replications. Results showed that fruit number per plant (15.5/plot) and fruit weight per fruit (0.38kg/fruit), were significantly (P=0.05) higher where sole cucumber was not weeded (13.5/plot and 0.32kg/fruit) than where sole cucumber was weeded. However, intercropping cucumber with maize did not significantly improve the growth characteristics of either cucumber or maize irrespective of whether weeded or un-weeded. On the other hand, un-de-husked and de-husked cob weights of maize were higher where sole maize was weeded (39g and 29g) and where it was intercropped with cucumber and weeded (28g and 21g) than where it was planted sole and weeded (26g and 20g) and where it was intercropped with cucumber un-weeded (23g and 19g). The suppressing effect of cucumber on weeds was not impressively demonstrated on maize yield. However, more income was realized from the sale of cucumber fruits from the un-weeded plots which showed that weeds did not affect its yield. On the other hand, less fruit yield was recorded from the weeded plots of cucumber showing weeding may not be required in cucumber plots after a certain growth stage.

Keywords: weed management, cucumber intercropped with maize, suppressing effect of cucumber, sole cucumber, sole maize

INTRODUCTION

Intercropping is the growing of two or more crops in close proximity to promote interaction between them and is practiced with the aim of maximizing plant cooperation rather than plant competition for maximum crop yields per unit area (1). The advantages of intercropping include; greater system resilience by the interplay of different crops (2-3), greater production at crop edges (4), reduced insect pest incidence (5-6), reduced disease transfer (7, 8, 3) and delivers environmental benefits such as greater soil and water conservation potential (9, 2, 10, 11). Despite the advantages of mono- or sole-cropping (12-13) such as reducing input use, weed control with selective herbicide, ease of mechanization, etc., intercropping is still a common practice among the smallholder farmers throughout the tropics (14) in the past decades. Harwood (15) stated that intercropping increased productivity per unit of land, offered better utilization of resources, minimized risks, reduced weed competition and stabilized yield. All together, any cultural practice that increases the growth vigour of crops will discourage competition from weeds. Several factors influenced the intercropping of crops such as maturity of crops, planting density, time of planting as well as socio-economic status of the farmer and the region (16).

Arnon (17) reported that for food crop production, intercropping is frequently used and the system varies from locality to locality depending on the farmer's total resources. Smallholder farmers routinely intercrop cereal staple crops (maize, sorghum, millets, etc.) with vegetable crops (pumpkin, squash, gourd, cucumber and water melon) and legumes (beans, cowpea and groundnuts). It has been reported that pumpkin, cucumber and water melon are the most popular vegetable crops intercropped with other staple cereal crops, being vine prostrate and dense crops which have the potential to act as live mulch to suppress weed germination and growth, and reduce moisture loss from the soil under the cereal canopy. Evidence of better weed control is reasonably clear where intercropping provided a more competitive effect against weeds either in time or space than those of mono-cropping (2).

Weeds are naturally occurring plants that are injurious in agricultural systems (18). Most weeds are opportunistic, filling in voids in the farm and can only grow or exist if there is space for them. Weeds harbor insects and disease organisms, serve as alternate hosts to pests, compete with crops for nutrients, moisture, light and space (19), they may increase insect and disease damage to crops, decrease the quality of crops, or cause harm to animal health that feeds on them. Weeds reduce crop yield and quality by competing with the crops (20). Despite yield stability, or risk spreading advantage in intercropping the most important is the

Received: Sep,, 2013:; Revised: Oct, 2013 ; Accepted: Dec, 2013

*Corresponding Author

Aniekwe*, N.L.
Ebonyi State University, Abakaliki, Nigeria
Email: l_ aniekwe @yahoo .com

possibility of better control of weeds, pests or diseases. The weed aspect is relatively straightforward, better control being possible where intercropping provides a more competitive community of crop plants, either in space or time, than sole cropping (21). Studies have shown that prostrate crops like Egusi melon suppressed weeds and reduced early weeding in maize (22, 23), cucumber intercropped with Okra reduced weed infestation (24), and pumpkin intercropped with maize reduced weed growth in the plots (25). In view of these observed and advantages of intercropping, studies were carried out to investigate the effect of weed management on the growth and yield of cucumber intercropped with maize in Abakaliki.

MATERIALS AND METHODS

Field experiments were conducted at the research farm of Department of crop production and landscape management, Ebonyi State University, Abakaliki, located at latitude 06o 19' 407" N, longitude 08o 7'831"E and at an altitude of 447m above sea level. The rainfall pattern occurs in two peak periods with very short break usually in August (August break) with a total annual rainfall of 1700mm-2060mm. The predominant weeds observed in a quadrant on the farm as identified by the University Herbarium, included elephant grass, sida weeds, calapogonium, pureria, goat weed, carpet grass, etc. and many other less important ones. The design of the experiment was a 3x2 factorial laid out in a randomized complete block design (RCBD) in four replications. The plot size was 2m x 2m with total land area of 96m2. Six treatment combinations were involved: maize sole weeded (COM1W1), maize sole un-weeded (COM1Wo), cucumber sole weeded (C1MOW1), cucumber sole un-weeded (C1MOWO), maize + cucumber weeded (M1C1W1) and maize + cucumber un-weeded (M1C1WO). Maize (Oba Super II) was planted at a spacing of 75cm x 25cm while cucumber (Poinsett 76) was planted at a spacing of 50cm x 30cm. Blanket application of a compound fertilizer (NPK 15:15:15) was made to augment the native soil fertility at the rate of 400 kg/ha. Weeding of the sole plots was manually done at three weeks interval while the intercropped plots were left un-weeded. Data collected were analyzed using the analysis of variance (ANOVA) procedures described by Steel and Torrie (26) while mean separation for detecting significant differences between means was done using Fisher's least significant difference (F-LSD) according to Carmer and Swanson (27).

Table1: Effect of weeding practice on the growth and yield parameters of cucumber intercropped with maize.

Treatment	Fruit No/plot	Fruit Wt/fruit(kg)	Days to Flower initiation	No of Leaves/plant	Leaf area (Cm2)	Vine length Cm
C1MOW1	13.50	0.32	30.55	43.85	81.63	57.37
C1MOWO	15.50	0.38	35.68	54.35	83.73	64.65
C1M1W1	12.75	0.29	33.55	37.10	80.68	46.80
C1M1WO	11.70	0.22	21.45	37.00	75.53	51.00
F-LSD(P=0.05)	1.83	0.01	ns	ns	ns	ns

Key: C1WoW1 = Weeded sole cucumber; C1MoWo = Un-weeded sole cucumber; C1M1W1 = weeded cucumber intercropped with maize; C1M1Wo = Un-weeded cucumber intercropped with maize.

Table 2: Effect of weeding practice on the growth and yield parameters of maize intercropped with cucumber.

Treatment	Plant Ht cm	No of Leaves	Leaf area (cm2)	Left area Index	Cob wt Undehusked(g)	Cob wt Dehusked (g)
COM1W1	179.25	13.38	132.09	4.26		
COM1WO	166.50	13.38	117.35	3.44		
C1M1W1	160.35	13.75	121.24	3.55		
C1M1WO	160.50	11.69	107.83	3.24		
F-LSD(P=0.05	ns	ns	ns	ns	0.09	0.02

Key: C1WoW1 = Weeded sole cucumber; C1MoWo = Un-weeded sole cucumber; C1M1W1 = weeded cucumber intercropped with maize; C1M1Wo = Un-weeded cucumber intercropped with maize.

Table 3: Cost analysis of weeding practices in cucumber production and income from cucumber yields.

Treatment	Weeding cost (N50/plot)	Fruit wt (kg/ha)	Fruit No/ha	Income N/ha	Price N/kg	Actual come (N)
Un-weeded	-	14725	38750	1,178,000	80.00	1,178,000
Weeded	125,000	10800	33750	864000	80.00	739000

RESULTS AND DISCUSSION

The effect of weeding practices on the growth and yield parameters of cucumber intercropped with maize is summarized in Table 1. The weeding treatment and intercropping of cucumber with maize did not significantly (p= 0.05) improve the vegetative growth of cucumber but the fruit number per plot and fruit weight per fruit were improved. Un-weeded sole cucumber gave the highest number of fruits per plot (15:50) and consequently the highest weight per fruit (0.38kg), while the weeded sole cucumber followed with 13.50 fruits per plot and 0.32kg per fruit. The low yield parameters observed in the experiment was not in consonance with reports from Ofosu-Anim and Limbani (24) that the fruit number of cucumber was higher under intercropping with Okra than under sole cropping.

Maize yield parameters were consistent with weeding practices (Table 2). As in the cucumber, the vegetative growth of maize was not significantly different whether weeded or not. The un-de-husked weights of maize cobs ware higher under weeded sole maize and under weeded intercropping than under other treatments. This was expected because weeds have been reported to have caused low yield in maize, but weeding could improve yield from 40% to 46% (25), and may increase up to 50% (28) or up to 17.9% (29). Weeding prevents yield losses in maize (20).

Friesen (30) reported that in field experiments during 1975 to 1977, the final yield of cucumbers was unaffected when a naturally occurring weed infestation remained in the plots for the first 12 days after emergence in 1975 and for the first 24 days in 1976 and 1977, provided the crop was kept weed-free subsequently. This means that there was no loss of yield caused by weeds that emerged later in the season, indicating that the critical period of weed interference was therefore between 12 and 36 days after crop emergence. Therefore, the unaffected yield obtained here must have been because the cucumber plants were able to outcompete the weeds (32) before the critical period of weed interference (between 12 and 36 days) after which subsequent weed growth did not lower the yield. Weaver (31) reported that cucumber yields were reduced if plots were not kept

weed-free for up to 4 weeks after seeding or if plots remained weed-infested longer than 3-4 weeks. In other experiments, cucumber yields were reduced significantly when only 5% of the weeds were allowed to remain in the plots longer than 24 days after crop emergence (30).

Cucumber by its growth nature (prostrate) could be significant cultural and biological technique for weed management in most food crops. The money spent weeding food crop farms either through herbicide or manual weeding could be saved by the use of cucumber (Table 3). Whereas more income was realized where weeding was not carried out under sole cucumber crops, it became clear that cucumber farms may be left without weeding yet expecting more income. Hopefully, increasing the cucumber density in intercropping system could help maize yield more than observed in this experiment. The high point of this report was the income analysis of the proceeds from weeded and un-weeded plots (Table 3). The result showed that weeded plots did not justify the practice by the number and weights of cucumber fruits. It was suspected that during weeding the fruiting process may have been disrupted or the vines disoriented. The undisturbed (un-weeded) plots had more fruit number and fruit weight which converted to more income. While 14,725 kg/ha of fruits were obtained from the un-weeded plots, only 10,800 kg/ha was obtained from the weeded plots and when the cost of weeding (N125,000) was subtracted from the income (N864,000) realized from the weeded plots, the actual income went down to N739,000 as against N 1,178,000 from the un-weeded.

We therefore conclude that zero weeding management can be practiced in cucumber farms and could be used effectively as a biological weed control in intercropping systems. This is based on the report of Dittmar and Stall (32) that “establishing a good crop stand in which plants emerge and rapidly shade the ground is an often overlooked tool for reducing weed competition. The plant that emerges first and grows the most rapidly has the competitive advantage.” Cover cropping has been a common practice in weed management (33) among the small holder farmers with declining work force. Cucumber proves to play a double role; smother weeds and produces high valued fruits for nutritional well being and income generation.

REFERENCE

1. Sullivan, P.2001. Intercropping principles and production practices, Appropriate Technology transfer for rural areas (ATTRA), USDA Rural Business
2. Theunissen, J. 1997. “Intercropping in field vegetables as an approach to sustainable horticulture”. Outlook Agric 26.95-99.
3. Wolfe, M.S. 2000. “Crop strength through diversity” Nat., 406: 681-682.
4. Ghaffarzadeh, M., F.G. Prehac and R.M. Cruse, 1997. Tillage effect on soil water content and corn yield in a strip intercropping system” Agron.J., 89: 893-899.
5. Theunissen., J. and Schelling, G. 1996, “Pest and disease Management by intercropping Suppression of thrips and rust in Leeka” Int. J. Pest Management. 42:227-234.
6. Ramert, B. 2002. The use of mixed species cropping to manage pests and diseases-theory and practice U.K. Organic Research 2002. Proceedings of the COR conference, Aberystwyth
7. Finckh, M.R. and Wolfe, E.C. 1997. The use of biodiversity to restrict plant diseases and some consequence for farmers and society, In: Jackson, L. (ed.), Ecology in Agriculture, pp 203-238. San Diego, Academic press
8. Garrett, K.A. and Mundt, C.C. 1999. “Epidemiology in mixed host population”. Phytopathol., 89: 984-990.
9. Gilley, J.E., L.V. Kramer, R.M. Cruse and A. Hull, 1997. “Sediment Movement within a strip intercropping system”. J. Soil Water Conservation, 52: 443-447
10. Poudel, D.D., G.J. Midmore and L.J. West, 1999. “Erosion and productivity of vegetable systems on sloping volcanic ash-derived Philippine soils” Soil Sci. Soc. American J., 63:1366-1376.
11. Gilley, J.E., L.M. Risse and B. Eghball, 2002. “Managing run off following manure application” J. Soil Water Conservation, 57: 530-533
12. Anderson, J.R., Dillon, J.R. and Hardaker, J.B. 1980. Agricultural Decision Analysis, Iowa state University Press, Ames IA.
13. Gondwe, W.J. 1992. Evaluation of yield and yield components of maize (Zea mays L.), beans (Phaseolus vulgaris L.) and potato (Ipomoea batatas L.) in a three crop intercropping system at low soil nitrogen. Ph.D Thesis, Cornell University, Ithaca, New York, USA
14. Anil, S. 2000. Time of weed emergence and critical periods in crops, IPM weed ecologist, Kearney Agricultural Center Bulletin
15. Harwood, R.R. 1975. Farmer oriented research aimed at crop intensification. Proceedings of the cropping system workshop, march 18-20. IRRI, Los Bonos, Philippines.
16. Andrew, D.J. and Kassam, A.H. 1976. The importance of multiple cropping in increasing world food supplies In: multiple cropping, Papendick, R.I, Sanchez, A. and Trippett, G.B. (eds) American society of Agronomy, Madison, WI, USA, pp 1-10
17. Arnon, I. 1972. Mixed cropping In: Crop production in dry regions. London, England; Leonard Hill, vol. 1 pp 475-476
18. Worsham, A.D. 1991. Role of cover crops in weed management and water quality In: Hargrove, W.L. (ed.) Cover crops for clean water, Proceedings of an international conference, April 9-11, 1991. Jackson Tennessee, soil and water conservation society, Ankeny, Iowa, USA, pp 141-145.
19. Anderson, W.P. 1983. Weed Crop completion In: Weed science, principles, 2nd ed. pp 15-33. West publishing company, St Paill, Minn, USA
20. Akobundu, I.O. 1987. Weed Science in the Tropics: principles and practice, John Wiley and Sons, Chichester.
21. Litsinger, J.A. and Moody, K. 1975. Integrated pest managements in multiple cropping systems In: Multiple Cropping Symposium (proceedings), American Society of Agronomy Annual meeting, Knoxville, Tennessee, 24-29th August.
22. Akobundu, I.O. 1993. How weed science can protect soil, International Agricultural Development 13 (1) 7-9
23. Obiefuna, J C. 1989. Biological weed control on plantains (Musa AAB) with egusi melon (Colocynthis citrullus L.). Biological Agriculture 6:221-227
24. Ofosu-Anim, J. and Limbani, N.V. 2007. Effect of intercropping on the growth and yield of cucumber (Cucumis sativus L) and Okra (Abelmoschus esculentus (L) Moench) J. Agri. Biol. Vol. 9, No. 4. 594-597
25. Mashingaidze, A.B. 2004. Improving weed management and crop productivity in maize systems in Zimbabwe Ph.D Thesis Wageningen University.
26. Steel, R.G.D and Torrie, J.H. 1980. Principles and procedures of statistics, 2nd edition. MacGraw- Hill, New York.

27. Carmer, S. G. and Swanson, M. R. 1971. Detection of differences between means: A Monte Carlo Study of five pair-wise multiple comparison procedures, Agronomy Journal, 63:940-945
28. Afzal, M. 1988. Cultivation of maize, Directorate of Agro information, 21 Aghakhan Road, Lahore, Pakistan.
29. Weaver, S. E. 1984. Critical period of weed competition in three vegetable crops in relation to management practices. Weed Research, 24: (5) 317-325
30. Berzsenyi, Z. 1985. Economical aspects of weed control in maize. Field Crop Abstracts 38:5268
31. Friesen, G. H. 1978.Weed interference in pickling cucumbers (Cucumis sativus).Weed Science
Vol. 26, No. 6, pp. 626-628
32. Dittmar, P.J. and Stall, W.M. 1999. Weed management in cucurbit crops (Muskmelon, Cucumber, Squash and Watermelon) University of Florida Institute of food and agricultural sciences (IFAS) extension. http://edis.ifas.ufl.edu
33. Ngouajio, M. and Mennan, H. 2005. Weed populations and pickling cucumber (Cucumis sativus) yield under summer winter cover crop systems. Crop Protection, 24: (6) 521-526