International Journal of Agriculture Innovations and Research
Volume 3, Issue 4, ISSN (Online) 2319-1473
Manuscript Processing Details (dd/mm/yyyy) :
Received : 25/12/2014 | Accepted on : 07/01/2015 | Published : 17/01/2015

Herbicide Activity of an Onion Weeding-Earthing Up Machine and its Effects on Ferruginous Soil Microorganisms, in Burkina Faso

G. Kambou
email: kambougeorges2000@yahoo.fr

B. Ouattara
email: boubakarouattara35@yahoo.fr

F. Kini
email: phyto00123@yahoo.fr

Abstract: **A comparative study of a weeding-earthing up machine SBK1 biological efficiency and pre emergency, post emergency herbicides (pendimethalin, oxadiazon, cycloxydim, haloxyfop-r-methyl) against *Cyperus spp., Spigelia anthelmia, Digitaria horizontalis* etc… which cause damage to onion, was done at Kou Valley, in Burkina Faso. The biological efficiency of different weeding methods was evaluated by weeds' counting, and by weighing weeds' dry biomass, using a 0, 25 m² quadrant and according the VILITSKY formula. The microorganisms' counting was done on appropriate media cultura. The weeds reduction rate by the weeding - earthing up machine varied from 37.26% to 94.15% while those of the herbicides, from – 49.80% to 49.34%. The herbicides inhibited cellulolytic bacteria when compared with mechanical weeding and untreated weeding check plot. This weeds reduction and the development of cellulolytic bacteria on mechanical weeding plot increased the yield up to 14.63% compared to untreated weeds check plot and from 6,22% to 19,07% compared to the use of herbicides. The use of the weeding - earthing up machine SBK1 augurs a new integrated pest management technology against onion weeds, preserving consumers health and environment.**

Keywords: **Weeding-Earthing Up Machine, Herbicides, Microorganisms, Onion.**

I. INTRODUCTION

Onion is more and more needed for the consumptions and exportation in developed countries as in developing countries. This vegetable is an economically important crop, has a lot of interest for Burkina Faso government and for the stakeholders actors. Its production helps to maintain the young people in their villages and in the same time contributes in reducing their unemployment. It also helps in occupying farmers during the dry season, to reduce migration inside and outside the country (Ivory Coast, Ghana etc…).

Onion production (bulbs, leaves) is increasing in Burkina Faso. According to the agricultural statistics directorate, from 1997 to 2002, Onion production has increased from 28 318 T to 33 885 T. For the 2004/2005 year production season, the national production of onions bulbs was estimated to 54 959 tons for 3681 ha with an average yield of 15 tons per ha [1].

Despite this increasing production, onion demand is still higher than the offer during a long period of the year leading to onion importation to fill the deficit. Besides this, onions are subject to pest infestations as nematodes [2]. These infestations lead to loss of yields, some difficulties of storage and to the decrease of onion quality. In 2011, farmers of Bulkiemdé and Sanguié provinces faced important losses of onion crops due to the severity of diseases (bacteria and fungi) infestations.

The evaluation of genetic resistance to diseases of forty farmers' varieties of onion collected in West Africa and maintained ex situ at the INERA station of Farako-bâ could help to identify potential resistant genotypes [3] along with the identification of agronomical performant varieties. Onion is also infested by weeds, that cause important yield losses up to more than one tone per ha. According to [4], weeds control is very important for onion production. The results from [5], [6], [7], [8], [9] reported that onion less resist to weeds' competition. In fact, the cylindrical onion leaves shape does not provide convenient soil cover to affect the growth and development of weeds. In Burkina Faso, the main weed species affecting onion production are rhizomatous grass (*Imperata cylindrica*, etc…), tubers grass (*Cyperus esculentus*, *C. rotondus*) and creeping grasses. Hand weeding is the most common method of control. Some herbicides like glyphosate are mainly used for plots cleaning before crop planting. Against grasses and broad leaf weeds, it has been recommended to farmers the use of two emergence herbicides, STOMP 455 CS (Pendimethalin 455 g/l, Oxariz 250 EC (Oxadiazon 250 g/l) followed by post emergences IKOKADIGNE (Halloxyfop – r – méthyl 104 g/l) or focus Utra (Cycloxidim) without studying their secondary effects on soil fertility. This present study aims for the first time, to assess the biological efficiency of a weeding- earthing up machine SBK1 as alternative to herbicides and their effects on soil biological properties.

II. MATERIALS AND METHODS

The experiment has been set at the Kou Valley, on a ferruginous soil characterized at the depth of 0 – 20 cm : by total organic matter (%) = 2.93, Total carbon (%) = 1.,698, total nitrogen (%) = 0.139, total potassium (ppm) = 182. total phosphorus (ppm) = 243. Ph water = 6.60.

The plant material was the onion variety Violet de Galmi with a growing cycle of 120 – 140 days. The cultivation technics consisted of plowing followed by milling and manure spreading at the rate of 20 T /ha. The plants from the nursery have been planted at a spacing of 20 cm between rows and 10 cm between the seed holes. A NPK fertilizer (15-15-15) was applied at the rate of 200kg/ha

The cropping operations consisted of some irrigation when necessary and weeding plots according to the experimental protocol. The experimental design was a randomized complete bloc design (RCBD) with 6 treatments in 4 replications. The 6 treatments were: untreated plot (control); mechanical weeding by weeding earthing- up machine kambou 1 (SBK 1); Stomp CS 3l/ha followed by focus ultra 2l/ha; Stomp CS 3l/ha followed by Ikokadigné 0.9l/ha; Oxariz 3l/ha followed by Focus ultra 2l/ha ; Oxariz 3l/ha followed by Ikokadigne 0.9l/ha. The size of the experimental unit was 2 m x 5 m = 10m², the useful plot 1.80 m x 4.90 m= 8.82 m².

The biological efficiency of different treatments was studied using the method of counting, and, weighing the weeds dry biomass [10] using à 0,25 m² quadrant at regular intervals in diagonal, in the same way, in each useful plot on the 8th, 17th, 31th , 43th , 64th and 88thdays after application (DAA). The reduction rates of weeds, according to the dry biomass, were evaluated by the formula [11]:

$$C = 100 - (Bo.100/BK)$$

Where, C = reduced weeds rate compared to untreated control (%),

Bo = number of weeds per m² or weight of dry biomass (g/m²) of herbicide treatment at first (2th or 3th etc...) counting,

BK = number of weeds per m² or weight of dry biomass (g/m²) of the untreated plot at first (2th or 3th, etc..) counting.

The weeds flora analysis was done using identification keys of [12], [13], [14] and [15]. Microorganism counting was done on media cultura. The amnonifying bacteria on the M.P.A (Meat-Peptone-Agar) media; nitrifying bacteria on the A.A.A (Amidon-Ammoniac-Agar) media; microscopics fungies on Czapeck-Dox media and cellulolytic bacteria on Getchinson media [16]. The yield components were estimated after counting onion bulbs and weighing it.

An analysis of variance of data [17] was computed and means separations were done using Newman-keuls test at 5% level using STAT- ITCF software. The correlations between the studied factors were computed, using ORIGIN 3.0 software.

III. Results

A. Effects of the Weeding-Earthing up Machine and Herbicides on Weeds Dry Biomass

At the 17th day, after herbicide application, there was no significant difference between mechanical weeding, herbicides and the untreated plot (Table 1).

At the 31th day after application, the average effect of herbicides and mechanical weeding (3.98g / m²) showed a reduction of 8.08% compared to the untreated control. Mechanical weeding reduces the weed dry biomass of 65.82% compared to the control. Between other treatments there was no significant difference.

At the 43th day after application, the average effect of mechanical weeding and herbicide (4.17g / m²) showed a reduction of 11.85% compared to the untreated control. Mechanical weeding showed a reduction of 47.63% compared to the untreated control. Between other herbicide treatments and the untreated control there was no significant difference.

The same trend continued at the 64th day and 88th day after application.

In the 64th day after treatment, the average effect of mechanical weeding and herbicides (4.87g/m²) revealed a reduction of 20.81% compared to the untreated control. The reduction in mechanical weeding was 71.06% compared to the untreated control. Between other treatments there was no significant difference.

In the 88th day after application the average effect of mechanical weeding and herbicides (6,51g / m²) indicated a reduction of 29.69% of weed dry biomass compared to the untreated control. Mechanical weeding at this stage gave a reduction of 54.00% compared to the untreated control. There was no significant difference between herbicides and untreated control.

From 31th day to 88th day after application, only mechanical weeding provides a significant reduction of weeds dry biomass in comparison with the untreated control.

B. Weeds Dry Biomass Reduction Rate by the Weeding-Earthing up Machine (SBK 1) and by Herbicides.

Using [11] formula and according to the weeds dry biomass in untreated control, the reduction rate of weeds in mechanical weeding ranged from 37.26% to 94.15% (Table 2).

The reduction rate was ranged from - 11, 94% to 56.43%. for Stomp CS followed by Focus ultra , from - 21.74% to 45.99% for Stomp CS followed by Ikokadigné. Those of Oxariz followed by the Focus ultra ranged from - 49.80% to 49.43% while the rate of Oxariz followed by Ikokadigné ranged from - 33.97% to 29.40%.

Mechanical weeding leads to strong reduction of weed dry biomass in comparison with pre and post-emergence herbicides effects.

C. Effects of Weeding-Earthing up Machine (SBK 1) and Herbicides on Onion Weeds Flora.

The weeding-earthing up machine and herbicides have influenced the onion weed flora (Table 3)

The experimental plots were mainly grassed by sedges .The weeding-earthing up machine, in two weedings, reduced them more than 50%. In mechanical weeding plots, *Spigelia anthelmia* of *Loganiaceae family, Euphorbia heterophila* of *Euphorbiaceae* family and *Stachystapheta spp.* were significantly reduced. The effects of herbicides on grasses and dicots were also efficient reducing significantly their invasion. However, *Euphorbia heterophila* proved to be resistant to these herbicides. Oxariz followed by Focus ultra and by Ikokadigné was efficient against the Cyperaceae.

D. Effects of Weeding-Earthing up Machine (SBK 1) and Herbicides on Soil Microorganisms.

Compared to cellulolytic bacteria, the average effect of mechanical weeding and herbicides (10, 49.1000 / 1g dry soil) indicated a reduction of 24.91% of bacteria compared to untreated control during onion full maturation. However, it should be noted that the number of bacteria in mechanical weeding did not differ from that of the untreated control. In the opposite, herbicides inhibited cellulolytic bacteria at this onion phenological stage. In general, the number of these microorganisms is greater than the period before herbicide application (Table 4).

In regard to fungi, the average effect of mechanical weeding and herbicides (18, 17.1000 / 1g dry soil) revealed an increase of 66.81% compared to the untreated control. The weeding- earthing up to an increase of 143.17% microscopic fungi, compared to the untreated control. Between the herbicides, only stomp CS followed by Focus Ultra led to 4 times more microscopic fungi compared to the untreated control. In general, the number of fungi at full maturation stage is greater than the period before herbicide application.

In regard to ammonify bacteria, the average effect of mechanical weeding and herbicides (7.14. Million / 1g dry soil) led to an increase of 11.56% compared to the untreated control. This increase in Stomp CS followed by Focus ultra is more than 29. 06% compared to the untreated control. The other treatments showed no significant difference with the control. Compared to the period before herbicides application, lower ammonify bacteria number is noted after application.

The effect of herbicide application on nitrify bacteria followed the same pattern. The average effect of mechanical weeding and herbicides (6.84 .millions / 1g dry soil) led to a slight increase of 1.03% compared to the untreated control. Practically, between weeding- earthing up machine, herbicides and untreated control there is no significant difference.

E. Effects of Weeding-Earthing up Machine (SBK 1) and Herbicides on the Onion Yield.

As shown in Figure 1, the different methods of onion weeds' management have affected onion yield (Figure 1).

The weeding earthing- up machine provided an increase of yield of 14.58% compared to the untreated control. Between herbicides, only the Stomp CS followed by Ikokadigné providesd an increase of 7.79% yield compared to the untreated control. The weeding earthing-up machine led a yield surplus of 6.79% to 18.46% compared to pre-emergence and post-emergence application of herbicides. This yield was equivalent to Stomp CS 3l/ha followed by Ikokadigné 0.9l/ha.

IV. Discussion

The different methods of mechanical and chemical control affected weeds population density as shown by the correlations between performance and the factors studied on 31th day and 43th day after application of herbicides.

At the 31th day after application, this correlation is expressed by the following mathematical relationship Y = 30.96 + -0,19x with Sd = 1.02; r = - 0.86 (p = 0.03). In the 43th day this correlation is expressed by the following equation: Y = - 0,20x + 31.35 with Sd = 1.09 ; r = - 0.84 (p = 0.04).

The changes occurred on onion weed not only by the ways the herbicides act but also by their dosages, persistence of action and spectrum of activity.

Thus, Stomp CS, which active ingredient is pendimethalin, inhibits cell division and elongation in the stem meristems and in the root apex of weeds. Its effects can be extended to many broadleaf weeds and grasses. Stomp CS also acts by inhibiting seed germination and on very young seedlings, in wet conditions. Its effectiveness would be significantly worse on cruciferous and some compositeae and have a long persistence of action [18] .

Oxariz, which active ingredient is oxadiazon affect young tissues without being absorbed by the roots and transported within the plant. It is persistent and is active in pre-emergency and post emergency of many broadleaf weeds and annual grasses [18], [19].

Within the post-emergence herbicides, Focus ultra, which active ingredient is Cycloxydine of chemical family cyclohexadione, is absorbed by the green parts of the plant and some, by the roots. With its systemic property, it migrates to the meristematic tissue and acts by inhibiting fatty acid biosynthesis [20]. It also covers grasses.

Ikokadigné, which active ingredient is haloxyfop-r-methyl is primarily absorbed by the leaves but also by the roots. It inhibits lipid synthesis and blocks immediately the growth of grass (weeds) . It is effective only on annual and perennial grasses [18].

During our experimentation the characteristics of these herbicides were confirmed. The herbicides application in pre-emergence and post-emergence, effectively, reduced some grass density like *Digitaria horizontalis, Setaria pallid-fusca Rottboelia cochinchinensis, Scrobulatum Paspalum, Setaria barbata* etc. (Table 3). These results corroborate those obtained by [21], [22] and [9] on the efficiency of pendimethalin against grasses. However, as mentioned by [23] their effectiveness may has varied because of the retention of pendimethalin by soil humic acid in relationship with different cropping systems. The soils of Kou Valley is poor in organic matter (C / N = 12). The phenomena of retention cannot only explain this more than the surface or depth leaching phenomena, which can explain inefficiency of herbicides. However, these herbicides were not efficient against *Euphorbia heterophila.*

The mechanical weeding allowed to reduce grasses and broadleaf weeds density, but also *Euphorbia heterophila* , *Spigelia anthelmia* and *Cyperus* spp. as well.

Besides [24] recognized that pendimethalin and oxadiazon, in combination with a weeding at 60 th day after treatment, resulted in an increase of bulbs yield.

In our experimentation we have not seen resistance cases of *Digitaria ciliaris* biotypes or other grasses like

Digitaria horizontalis (Table 3) as mentioned by [25]. The resistances of *E. heterophila* (Euphorbiaceae) *Melochia chorchorifolia* (Sterculiaceae) and *Zornia glochidiata* are due not only to herbicides action but especially to the difference in their biological organ structure of these weeds and grasses which are different to those of dicots.

The importance or deficit of the organic matter in the soil after herbicides spray has determined the presence of a particular group of microorganisms. Herbicides pre- and post-emergence inhibit cellulolytic bacteria and don't affect fungi at the onion complete maturation. The same situation has been mentioned by [26].

The relation nitrifying bacteria - bacteria ammonifying which is higher in mechanical weeding, certifies intensive mineralization in weeding- earthing up plots compared to herbicide treatments. These factors are also related to the reduction of *Cyperus* spp. by the weeding- earthing up machine and allow to obtain a significant increase in yield.

The efficiency of weeding- earthing up machnine is due to the spoon-shaped lugs taking a number of soil sedges bulbs. Coverage of weed between onions with soil rejected by the moldboard iron contributes to the mineralization and transformation of these weeds as green manure, important in the soil fertility.

V. Conclusion

The weeding ridging and herbicides affected the onion weed population density which is composed mainly of grasses, broadleaf weeds, and especially sedges. The weeding- earthing up machine SBK1 equipped with lugs allowed to reduce mainly *Cyperus* spp. It is also provided with mouldboards which contribute to soil mineralization and fertilization, from which, the higher number of cellulolytic bacteria compared to those of the pre and post-emergence herbicides. The weeding- earthing up machine Kambou 1 (SBK 1) ensures in two weeding earthing up, biological efficacy of 37.26 to 94.15% on weeds (3- 5 leaves), a significant increase in yield of 14.58% compared to the untreated treatment and of 6.79% to 18.46% compared to herbicides. The weeding- earthing up machine SBK1 augurs a new approach in integrated pest management, without using herbicides against onion weeds, preserving farmers, consumers health and the environment.

References

[1] Mahrh, 2007. Analyse de la filière maraichage au Burkina Faso. *Easypol* 107: 13-18.
[2] W. Pang, S. I. Hafez and P. Sundaraj, 2009. Pathogenity *of Meloidogyne halpha* on onion. *Nematropica* 39: 225-233.
[3] A. Rouamba, A. Ricroch and A. Sarr, 1993. Collecting onion germplasm in West Africa. FAO/IBPGR. *Plant Genetic Ressources Newsletter* 94: 15-17.
[4] S. R. Uygur and F.N. Gürbüz, 2010. Weeds of onion fields and effects of herbicides on weeds in Some Cukurova Turkey Region. *African Journal of Biotechnology* 9 (42): 7037-7042.
[5] A. Kizilkaya, H. Onen and Z. Ozer, 2001. Researches on the Effects of Weed Competition on Onion Yield). Türkiye Herboloji Dergisi, J.Turk. *Weed Science*. 4(2): 58-65.
[6] H.Z. Ghosheh, 2004. Single Herbicide Treatments for Control of Broadleaved Weeds in Onion *(Allium cepa). Crop Protection*. 23**:** 539-542.
[7] H.L. Carlson and D. Kirby, 2005. Effect of herbicide application rate and timing on weed control in Dehydrator Onions. University of Florida, *Intermountain Research and Extension Center,* 115: 4-5.
[8] J.R Qasem, 2006. Chemical weed control in seedbed sown onion (*Allium cepal*). *Crop Protection.* 25: 618-622.
[9] R Smith, S.A. Fennimore, S. Orloff and G.J. Poole, "IPM Pest Management guidelines: Onion and Garlic weeds". In: *Agriculture and Natural Resources*. M L Flint, Ed University of California Publication. 2008, pp. 34-53.
[10] A.M. Likov and A.M. Tulikov, *Weed Science Practical Handbook based on pedology*. M. Agropromizdat, 1985, 207 pp.
[11] I. N. Vilitsky**,** *Technologies of herbicides use*. L., Agropromizdat. 1989, 176 pp.
[12] J. Berhaut**,** *Flore du Sénégal*. Claire Afrique, Dakar. 1967, 485 pp.
[13] P. S. Terry, *Quelques adventices banales des cultures de l'Afrique Occidentale et la lutte contre celles-ci. Some common weeds of West Africa and Their Control*. Inkata press. Melbourne, Australia. 1983, 132 pp
[14] L Akobundu Okezie and C.W. Agyakwa, *West Africa Weed Guide*. IITA. Ibadan. 1989, 522 pp.
[15] D.E Johnson, *Les adventices en riziculture en Afrique de l'Ouest. Weeds of rice in West Africa.* Imprint Design. United kingdom, Hong Kong.1997, 312pp.
[16] E. Z Tepper, V. K. Tepper Chilnikova and G.I. Pirivierzeva, *Microbiology practical guide.* Agropromizdat, Moscow. 1987, 239 pp.
[17] B Dospiehov, *Field experimentation methods.* Kolos, Moscow. 1985, 270 pp.
[18] Acta, *Phytosanitary Index*. Marne, Tours. 2006, 824 pp.
[19] S. Adekpe, D.I. Shebayan, J.A.Y. ChiezeyY and U.F. Miko, 2007. Yield response of garlic *(Allium sativum* L.) to oxadiazon dates of planting and intra-row spacing under irrigation at Kadawa, Nigeria. *Crop protection*. 26: 1785-1789.
[20] Acta, *Phytosanitary Index.* Marne, Tours. 2009, 804 pp.
[21] C.H. Bond, J.A. Walker and T.W. Koger, 2009. Pendimethalin applied in seedbed stole rice production. *Weed technology* 33 (1): 167-170.
[22] S. C. Boydston, R.A. Collins and H.P. Frausen, 2010. Response of three switchgrass *(Panicum virgatum)* cultivars to mesotrione, quinolarac and pendimethalin. *Weed Technology* 24 (24): 336-341.
[23] A. Archan and F.M. Prasad, 2009. Retention of humic acids from pendimethalin by different form wastes and by soils in various management systems. *Acta Agronomica hungarica* 57 (1):15-20.
[24] M. F. Khokhar, M Tariq, S. Muhammad and K.M. Chaudlry, 2006. Evaluation of integrated weed management practices for onion in Pakistan. *Crop protection.* Vol. 25(9): 968-972.
[25] P.J. Lopez-Ovejero, R.F. Carvalho, J.P. Nicolai and M. Christoffoletti,2006. Relative susceptibility to post-emergence herbicides of case-resistant and susceptible biotypes of *Digitaria ciliaris*. *Planta-Daninha* 24:789-796.
[26] Y.B. Kruglov, *Soil microflora and pesticides*. Agropromizdat, Moscow. 1991, 129 pp.

Author's Profile

Dr Georges Kambou
Was born at Ouagadougou, on August 30, 1955. He is a Burkinabê and is the head of the vegetable, Fruit and Tuber Crop Programme of IN.E.R.A (Environment and Agricultural Research Institute). He has a Ph.D in Eco-toxicology from the Stavropol State agricultural Academy (USSR) in 1994 year. Fulbrighter Michigan State University (USA) in 2004-2005 year. He got an honorific Award from IITA (International Institute of Tropical Agriculture) in 1997 for his scientific contribution to maize weeds management. He is member of IAPPS. He has published the research paper in many national anfd international journals.
Email: kambougeorges2000@yahoo.fr

International Journal of Agriculture Innovations and Research
Volume 3, Issue 4, ISSN (Online) 2319-1473

Mr. Boubakar Ouattara
Was born on January 20,1980 at Bobo-Dioulasso. He is a Ph. D candidate in the vegetable, Fruit and Tuber Crop Programme of IN.E.R.A (Environment and Agricultural Research Institute). He has passed M. Sc. in ecotoxicology, at the university of Ouagadougou (2011 year).
Email: boubakarouattara35@yahoo.fr

Dr Félix Kini
Wa s born at Mamou, on May 2, 1963. He is a Burkinabê and he is the head of the pharmaceutical sciences Department, research associate of the I.R.S.S (Institute of Health Science Research). He has a Ph.D in organic chemistry (2008 year). Specialist subject: pharmacology. Professor at the university of Ouagadougou (Burkina Faso). He has published the research paper in many national anfd international journals.
Email: phyto00123@yahoo.fr

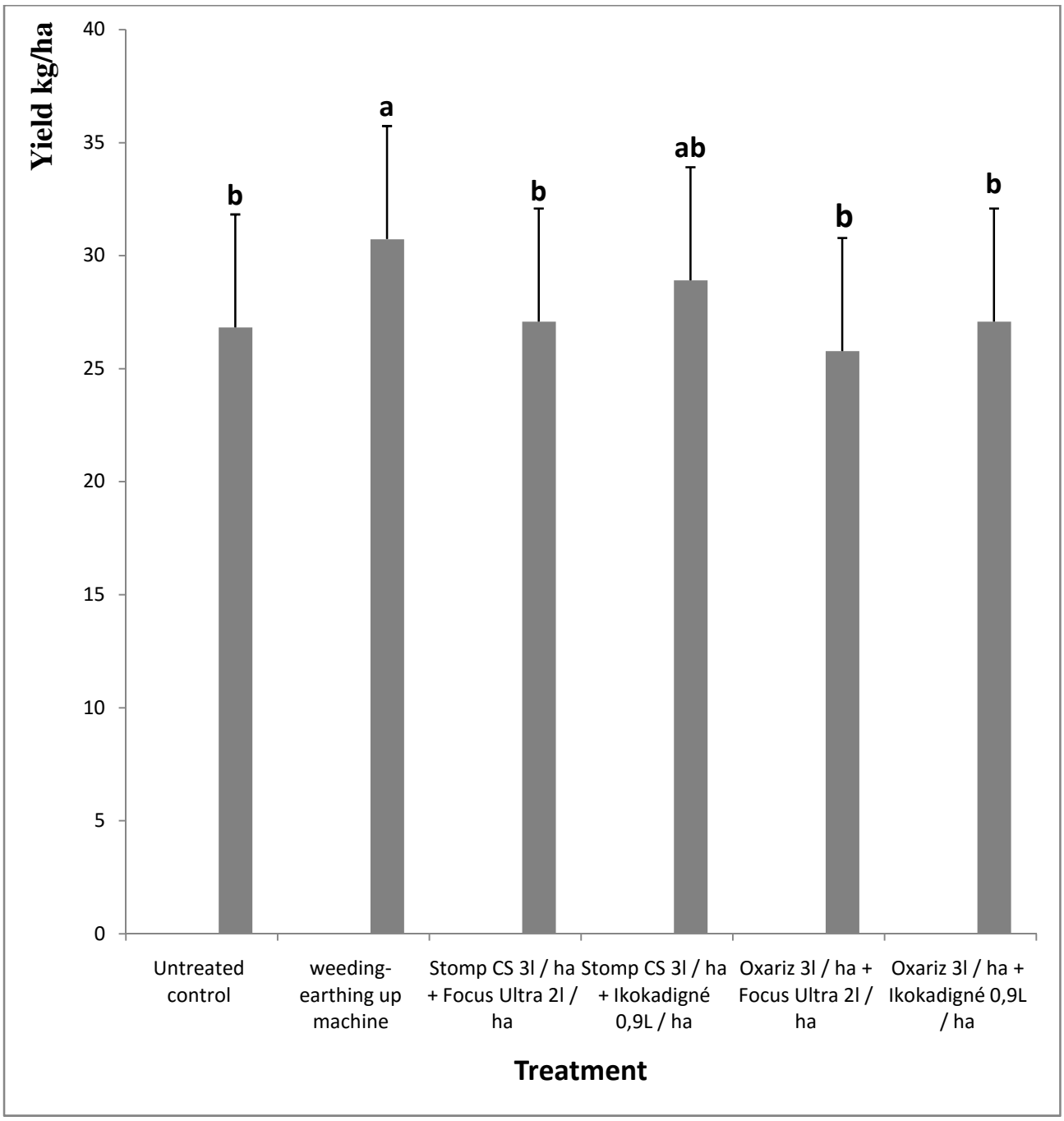

Figure 1: Effects of weeding- earthing up machine (SBK1) and herbicides on onion yield.

International Journal of Agriculture Innovations and Research
Volume 3, Issue 4, ISSN (Online) 2319-1473

Table I: Effects of the weeding- earthing up machine and herbicides on weeds dry biomass (g / m²).

	Observation periods (DAT= Day After Treatments)													
	8e DAA		17e DAA		23e DAA		31e DAA		43e DAA		64e DAA		88e DAA	
Treatment	Original data	After $\sqrt{X+1}$	Original data	After $\sqrt{X+1}$	Original data	After $\sqrt{X+1}$	Original data	After $\sqrt{X+1}$	Original data	After $\sqrt{X+1}$	Original data	Original data	Original data	After $\sqrt{X+1}$
Untreated control	7,26	2,78 a	16,64	4,16 a	13,39	3,77 a	17,90	4,33 a	17,25	4,22a	37,41	6,15a	87,04	9,26a
weeding-earthing up machine	4,26	2,26 a	10,44	3,23 a	1,54	1,58 b	1,21	1,48 b	4,07	2,21 b	2,19	1,78 b	17,69	4,26 d
Stomp CS 3l / ha + Focus Ultra 2l / ha	6,04	2,60 a	11,03	3,46 a	10,80	3,37 a	19,99	4,33 a	19,31	4,47a	35,37	5,31a	37,92	6,22 c
Stomp CS 3l / ha + Ikokadigné 0,9L / ha	6,38	2,63 a	11,68	3,51 a	8,70	3,08 a	18,83	4,42 a	21,00	4,63a	39,76	6,36a	47,01	6,90 bc
Oxariz 3l / ha + Focus Ultra 2l /ha	6,63	2,70 a	8,43	3,06 a	10,48	3,35 a	22,42	4,74 a	25,84	5,15a	27,14	5,27a	54,85	7,36 bc
Oxariz 3l / ha + Ikokadigné 0,9L / ha	8,73	2,96 a	13,11	3,73 a	13,79	3,75 a	23,98	4,95 a	19,37	4,40a	32,78	5,64a	61,45	7,80 b
Mean	2,65		3,52		3,15		4,04		4,18		5,09		6,97	
CV (%)	20,1		13,20		13,2		15,1		15,80		8,22		9,90	
ETR (ddl =15)	0,53		0,47		0,41		0,61		4,18		0,93		0,69	
ETM (SX)	0,27		0,24		0,21		0,15		2,09		0,47		0,35	

N.B: Means followed by the same letter(s) with in the same column and treatment are not significantly different at 5% level of probability using Newman-keuls test.

Table 2: Dry biomass reduction rate (%).

	Observation periods (DAA = Days After Application)						
Treatment	8e	17e	23e	31e	43e	64e	88e
Untreated control	-	-	-	-	-	-	-
weeding- earthing up machine	41,32	37,26	88,50	93,24	76,41	94,15	79,68
Stomp CS 3l / ha + Focus Ultra 2l/ha	16,80	33,71	19,34	- 0,50	- 11,94	5,45	56,43
Stomp CS 3l / ha + Ikokadigné 0,9L / ha	12,12	29,81	35,03	- 5,20	- 21,74	- 6,28	45,99
Oxariz 3l / ha + Focus Ultra 2l /ha	8,68	49,34	21,73	- 25,25	- 49,80	27,45	36,98
Oxariz 3l / ha + Ikokadigné 0,9L / ha	-20,25	21,21	- 2,99	- 33,97	- 12,29	12,38	29,40

Table 3: Effects of weeding- earthing up machine (SBK1) and herbicides, on onion weed flora (number / m²) at 88th DAA.

International Journal of Agriculture Innovations and Research
Volume 3, Issue 4, ISSN (Online) 2319-1473

Table 3: Effects of weeding- earthing up machine (SBK1) and herbicides, on onion weed flora (number / m²) at 88th DAA.

Genous	species	Families	Untreated control	weeding-earthing up machine	Stomp CS 3l/ha + Focus Ultra 2l / ha	Stomp CS 3l/ha+Ikokadigné 0,9L / ha	Oxariz 3l / ha + Focus Ultra 2l / ha	Oxariz 3l/ha + Ikokadigné 0,9L / ha
Cyperus	*spp*	Cyperaceae	22274	1696	1877	1704	1739	2086
Spigelia	*anthelmia*	Loganiaceae	59	1	17	11	20	9
Tridax	*procubens*	Compositae	3	1	4	6	-	11
Digitaria	*horizontalis*	Poaceae	27	22	-	4	3	-
Mullugo	*nudicaulis*	Mulluginaceae	2	2	-	-	3	-
Corchorus	*olitorus*	Tiliaceae	1	1	3	2	-	3
Setaria	*pallide-fusca*	Poaceae	31	12	9	1	6	3
Stachystarpheta	*Spp*	Verbenaceae	48	4	51	13	32	7
Euphorbia	*heterophylla*	Euphorbiaceae	27	4	42	39	39	29
Scoparia	*dulcis*	Scrophulariaceae	1	-	1	10	-	-
Stylosanthes	*anthelmia*	Papilionaceae	1	1	2	4	1	1
Sida	*rhombifolia*	Malvaceae	2	-	-	1	-	2
Rottboellia	*cochinchinensis*	Poaceae	1	-	-	3	3	-
Ocimum	*basillicum*	Lamiacée	7	-	-	-	3	-

Borreria	*verticillata*	Rubiaceae	-	-	-	-	2	-
Tephrosia	*sp*	Papilionaceae	-	2	7	5	1	1
Brachiaria	*lata*	Poaceae	1	1	2	-	-	2
Paspalum	*scrobiculatum*	Poaceae	5	-	2	1	-	6
Melochia	*corchorifolia*	Sterculiaceae	10	1	5	15	1	-
Physallis	*angulata*	Solanaceae	4	1	4	-	-	-
Boerhavia	*diffusa*	Nyctaginaceae	-	-	-	1	-	-
Cynodon	*dactylon*	Poaceae	1	-	2	-	1	1
Zornia	*glochidata*	Fabaceae	-	-	-	9	2	-
Spilanthes	*uliginosa*	Compositae	-	-	-	3	4	1
Euphorbia	*hirta*	Euphorbiaceae	3	-	-	1	1	-
Setaria	*barbata*	Poaceae	13	-	-	-	-	-
Acanthospermum	*hispidum*	Asteraceae	2	-	-	-	-	-
Andropogon	*gayanus*	Poaceae	-	-	-	-	-	-
Mean			**618,25**	**441,75**	**507,00**	**458,25**	**465,25**	**540,50**

International Journal of Agriculture Innovations and Research
Volume 3, Issue 4, ISSN (Online) 2319-1473

Table 4: Effects of weeding- earthing up machine (SBK1) and herbicides on soil microorganisms.

Treatment	Cellulolytic bacteria (1000/1g dry soil)		Microscopic fungies (1000/1g dry soil)		Ammonify bacteria (Million/1g dry soil)		Nitrify bacteria (Million/1g dry soil)	
	Before planting	Complete maturation	Before planting	Complete maturation	Before planting	Complete maturation	Before planting	Complete maturation
Untreated control	4,50a	13,97 a	2.10a	6,81 d	14,20 a	6,40 b	5,96 b	6,77 a b
weeding- earthing up machine	4,29a b	13,08 ab	1,55 b	16,56 c	10,05 b	7,35 b	16,87 a	5,32 b
Stomp CS 3l / ha + Focus Ultra 2l / ha	2,08 c	9,03 c	1,26 c	27,18 a	13,83 a	8,26 a	3,51 c	7,68 a
Stomp CS 3l / ha + Ikokadigné 0,9L / ha	4,68 a	11,79 b	1,00 d	22,90 b	14,37 a	6,73 b	5,76 b	7,61 a
Oxariz 3l / ha + Focus Ultra 2l / ha	4,75a	7,05 d	1,04 d	14,27 c	9,52 b	7,02 b	15,74 a	6,17 a b
Oxariz 3l / ha + Ikokadigné 0,9L / ha	3,63a	11,51 b	1,00 d	9,93 d	11,99 a	6,33 b	14,91 a	7,40 a
Mean	3,99	11,07	1,32	16,28	12,33	7,02	10,46	6,83
CV (%)	9,80	6,90	5,30	11,10	7,80	6,90	10,00	10,00
ETR (ddl=15)	0,39	0,79	0,07	1,81	0,96	0,49	1,05	0,68
ETM (Sx)	0,20	0,40	0,04	0,91	0,48	0,25	0,53	0,34