International Journal of Innovative Agriculture & Biology Research 6(1):18-23, Jan.-Mar., 2018

© SEAHI PUBLICATIONS, 2018 www.seahipaj.org ISSN:2354-2934

Effect of Weed Management Methods on Growth and Yield of Soybean (*Glycine max* (L) Merr) in the Wet Rain-Forest Zone of Nigeria

[1]D. Ajokporise; [2]F. O. Ogedegbe & [2]S. E. Nwangie

[1]Department of Agriculture, College of Education, Warri, Nigeria

[2]Department of Crop Science, Faculty of Agriculture, Ambrose Alli University, Ekpoma, Nigeria

All correspondents to email: ajosdave@yahoo.co.uk

ABSTRACT

Field experiments were carried out at College of Physical Education farm, Mosogar (Latitude 5^0 55^1N, longitude $5^0$$46^1$E and altitude 22m above sea level) in the rainy season of 2016 and 2017 cropping season to determine the effect of weed management methods on weed control, growth characteristics and yield of soybean. A randomised complete Block Design (RCBD) with three replicates was used. The treatments consisted of three hoe weeding management methods [at 3 weeks after planting (WAP), 3 and 5 (WAP) and 3, 5 and 7 (WAP)], three herbicides weed management methods (pendimethalin alone (1.16kg ai/ha) at one day after planting (DAP), fusilade forte alone (0.23kg ai/ha) at 3 weeks after planting (WAP) and pendimethalin followed by fusilade forte (1.16 + 0.23kg ai/ha)] and unweeded control check. Results obtained showed that the weed management methods reduced weed density, weed dry weight and increased % WCE when compared with the unweeded control check while soybean growth and yield attributes were enhanced in all hoe weeding and herbicides weed management methods when compared with the unweeded control check. Hoe weeding (at 3, 5 and 7 WAP) and pendimethalin followed by fusilade forte (1.16 + 0.23kg ai/ha) recorded values of weed management parameters, growth and yield parameters that were at par and significantly different from other weed management methods. Hoe weeding (at 3, 5 and 7 WAP) and pendimethalin followed by fusilade forte (1.16 + 0.23kg ai/ha) are thus recommended for subsistence and commercial soybean growers respectively in the area.

Keywords: soybean, weed, management, herbicide

INTRODUCTION

Soybean (*Glycine max)* is an annual legume cultivated in many parts of the world for its edible seeds rich in protein and oil. Soybean alone accounts for more than 50% of the world oil seed output (Joshi, 2001 and Imoloame, 2014). World-wide interest and focus on soybean is attributed mainly to its high seed protein and oil content (Tiamigu and Idowu, 2001). World production of soybean has been stimulated by a strong demand for edible oil and for protein food and feed. Soybean is prominent for its high protein as well as its high oil content among legumes crops world-wide. Gesimba and Langat (2005) reported that among seed oils soybean demand is extra-ordinary due to ever increasing consumption of soybean meal by livestock feed millers. Soybean meal demand is enhanced by the fact that it is a cheap source of protein, especially in developing nations. Soybean meal contains 44-49% protein and 30% carbohydrates and also rich in fibre, vitamins and mineral (Tafera, 2011).

Soybean has also been shown to be important in improving, soil fertility, reduces *Striga hermonthica* infestation on farmers' field, fixes atmospheric nitrogen, adds organic matter to the soil through leaf fall, and industrially used in making of soymilk, yoghurt, soybean oil, bread fortifier etc (Franke *et al*., 2004). Dugje *et al*. (2009) and Kanase *et al*. (2009) reported that soybean production in Nigeria is concentrated in the Sudan and Guinea savannah ecological zones and in these zones yield reduction due to weed infestation as reported by Sodangi *et al*. (2006) is 90% in the northern guinea savannah zone while Imoloame (2014) reported 83% in the southern guinea savannah zone of Nigeria. Sodangi *et al*. (2011) found out that poor soybean yield in farmer's plots is attributable to weed-crop-competition and low soil fertility. This is because in the early growth stages, soybean is a poor competitor especially with fast growing weeds. If such weeds are not controlled they may out grow the crop and thus cause yield reduction of great magnitude. Studies by Daugovish *et al.* (2003) indicated that in many parts of the world yield loss in soybean can be as high as 80%.

Weed management options available to the farmer depends among other things on the environment, scale of production, type of weed, stage of growth of weeds etc. In small scale soybean production hand weeding management methods are commonly used. Hand weeding methods such as hand pulling, hoe weeding, etc are however time consuming, labour intensive, expensive and difficult to attain clean weed free seed bed especially with rainy seasons crops like soybean (Adigun and Lagoke, 2003, Imoloame, 2014). In addition, labour shortage is usually associated with peak periods of weeding (Adigun and Lagoke, 2003).

In view the above, alternative methods of weed management is therefore, a subject of great concern. Use of herbicides in weed management is more adapted to large scale production. According to Akobundu (1987) factors that have made herbicides weed management methods more popular than manual weeding are: less drudgery, less adverse effect on early weed competition, low field labour demand. Others are little or no soil disturbance, thus reducing the risk of soil erosion and faster weed control methods and less likelihood of being affected by erratic weather conditions. Judicious use of herbicides in weed control has been shown to reduce cost of production and consequently increased profitability (Magani *et al*., 2012 and Imoloame *et al*., 2010). Considering the determination of the present government attention on agriculture towards increasing output of major crops in Nigeria, there is need to determine the effectiveness of some weed management methods on growth and yield of soybean in Mosogar, Delta State.

MATERIALS AND METHODS

Field experiments were conducted during the rainy season of 2016 and 2017 at the College of Physical Education Farm, Mosogar (Altitude 22 metres above sea level; Latitude 5^0 55^1N and Longitude 5^0 46^1E) to determine the effect of some weed management methods on the growth characteristics and yield of soybean. The experiment consisted of 7 treatments namely unweeded check, hoe weeding at 3 WAP, hoe weeding at 3 and 5 WAP, hoe weeding at 3, 5 and 7 WAP, pre-emergence application of pendimethalin at 1.16kg ai/ha, post emergence application of fusilade forte at 0.23kg ai/ha and pre-emergence application of pendimethalin (1.16kgai/ha) followed by post-emergence application of fusilade forte at 0.23kg ai/ha. These treatments were laid out in a Randomised Complete Block Design (RCBD) and replicated three times.

The soybean variety used was an early maturity variety (TGx1740-1F) which was sown on 10th July 2016 and 10th 2017 and harvested in November respectively. The crop was spaced at 40cm by 10cm to produce a plant population of 500,000 plants/ha. Pendimethalin was applied a day after planting with a knapsack sprayer which was calibrated to deliver 220l/ha spray volume while the fusilade forte was applied 3WAP. The hoe weeding was done at the specified date of the treatments. After clearing of the field the trash was packed while the smaller stomps were removed. The field was then allowed to grow the first flush of weeds which were killed with Glyphosate (force-up) at 4l/ha two weeks before the planting of the seeds (Dugje *et al*., 2009).

The planting rows were tilled lightly with the aid of hoe before the seeds were planted in the two seasons. Basal fertiliser application was carried out at the rate of 20kg N, 40kg P and 10kg K_2O. These were provided with a compound fertiliser 15:15:15. The experimental area was 22m by 13m while the gross plot was 3m by 2m. The net plot was 2m by 1.5m. The outer rows were discarded while only the 5 inner rows were used to collect data. The parameters measured were plant height, number of leaf, leaf area, number of branches, number of pods, pod weight per plant, seed weight per plant, 100 seed weight, soybean grain and stover yield. Data collected were subjected to analysis of variance and means separated using Least Significance Difference Test (LSD) at 5% level of probability.

RESULTS AND DISCUSSION

Effect of weed management methods on weed control

All weed control treatments reduced significantly weed density, weed dry weight when compared with the unweeded check at 8WAP and at harvest in the two seasons of the experiment (Table 1). This shows that the different weed management methods affected weed control parameters. Hoe weeding thrice had the lowest value for weed density and weed dry matter and recorded the highest percentage weed control efficiency. At 8 WAP weeds in the hoe weeding thrice (3, 5 and 7 WAP) were not measurable. Among the herbicides treatments, pendimethalin followed by fusilade forte (1.16 + 0.23kg ai/ha) had highest % WCE at 8 WAP and at harvest. This clearly shows the significance of integrated weed management method in enhancement of weed control when compared with the use of single weed management method. The work of Imoloame (2014), Hassan (2015) and Peer *et al*. (2013) corroborated this present finding. The lowest value of % WCE recorded in fusilade forte plots was because the herbicide was not effective against broad leaf which are relatively abundant in the area (Dugje *et al*., 2009).

Effect of weed management methods on vegetative and yield attributes

Table 2 presents the effect of the different weed management methods on soybean vegetative attributes at 12 WAP. The result shows that hoe weeding thrice had the highest value for plant height, number of leaves, leaf area and number of branches per plant among the hoe weeding treatments while pendimethalin followed fusilade forte (1.16 + 0.23kg ai/ha) recorded the highest values for the vegetative parameters among the herbicides treatments. Vegetative growth attributes were generally enhanced in the weed management treatments when compared with the unweeded control check. The ability of the weed management methods to effectively control weed allowed the soybean plants to utilize the growth resources this led to the high performance. The hoe weeding thrice (at 3, 5, & 7 WAP) treatment values for the vegetative growth attributes were at par with pendimethalin followed by fusilade forte (1.16 + 0.23kg ai/ha) herbicide treatment while hoe weeding (at 3 WAP) was at par with pendimethalin alone herbicides treatment with respect to growth parameters. The use of Glyphosate (force-up) in the land preparation stage to kill the first flush of weeds before planting of the seeds may be responsible for the improvement in growth attributes in hoe weeding (3 WAP) and pendimethalin alone herbicide treatment plots.

Effect of weed management methods on yield and yield components is presented in Table 3. Unweeded control check recorded the lowest value for yield and yield components when compared with the hoe weeding and herbicides treatment plots. The findings of Sodangi *et al*. (2006), Sodangi *et al*. (2011), Imoloame (2014), and Magani *et al.* (2012) have shown that competition for growth resources in unweeded control check results to reduced growth and yield attributes of soybean. In this study, hoe weeding (at 3, 5 and 7 WAP) and pendimethalin followed by fusilade forte (1.16 + 0.23kg ai/ha) produced total grain yield that is at par and significantly different from the other hoe weeding and herbicides treatments. The enhancement in yield attributes under the two treatments may be explained by better efficacy in weed management which allowed the crop to utilize more efficiently growth resources for better growth and yield. However, days to 50% flowering and 100 seed weight were not significantly affected by the weed management methods.

CONCLUSIONS

Pendimethalin followed by fusilade forte (1.16 + 0.23kg ai/ha) was most effective of the weed management methods in weed management, enhancement in growth and yield attributes among the herbicides weed management methods while hoe weeding thrice (3, 5, & 7 WAP) was most effective among the hoe weeding methods of weed management methods in this study. The two, pendimethalin followed by fusilade forte and hoe weeding (at 3, 5, 7 WAP) are at par in the parameters measured and thus recommended for commercial and small scale soybean farmers respectively in the area of study.

REFERENCES

Akobundu, I.O. (1987). *Weed science in the tropics: Principles and practice.* 2nd ed. John Wiley and Sons Inc. Chichester, 32-33.

Adigun, J.A., Lagoke, S.T.O., Kumara, V. And Erinle, I.D. (1993). Weed management studies in transplanted tomato in Nigeria Savannah. *Samaru Journal of Agriculture Research, 10;* 29-39.

Daugovish, O., Thil, D.C., and Shaft, B. (2003). Modeling competition between wild oat (Avena Fatual (L) and yellow mustard or Canola. *Weed science, 51;* 102-109.

Dugje, I.Y., Omoigui, L.O., Ekeleme, F., Brandyo-padhyay, R., Lavakumar, P. And Kamara, A.Y. (2009). *Farmers guide to soybean production in Northern Nigeria.* International institute of tropical agriculture, Ibadan: Nigeria, 1-21.

Franke, A.C., Schulz, S., Oyewole, B.D. and Bako, S. (2004). Incorporating short season legumes and green manure crop into maize based systems in the moist guinea Savannah of West Africa. *Experimental Agriculture, 40;* 463-479.

Gesimba, R.A. and Langat, M.C. (2005). A review on weeds and weed control in oil crops with special reference to soybean (Glycine max) in Kenya. *Agriculture tropice et subtropica, 32(2);* 56-62.

Kanase, A.A., Mendhe, S.N., Khawale, V.S., Jarande, N.N. and Mendhe, J.T. (2006). Effect of integrated nutrient management and weed biomas addition on growth and yield of soybean. *Journal of soils and crops, 16(1);* 236-239.

Joshi, N.C. (2001). *Weed control manual.* (5th edition), Delhi research station, Delhi: 538.

Imoloame, E.O. (2004). The effect of different weed control methods on weed infestation growth and yield of soybean (Glycine max) in Southern Guinea Savannah of Nigeria. *Global Journal of Science Frontier Research, 13(6);* 20-33.

Magani, E.L., Shave, P.A., and Avan, T. (2012). Evaluation of fluazifop-p-Butyl and propanil for weed control in sesame (sesamum indicum, L) in Southern Guinea Savannah of Nigeria. *American Journal of Experimental Agriculture, 2(4);* 680-689.

Sodangi, I.A., Gworgwor, N.A. and Joshua, S.D. (2007). Effect of weed interference and narrow row soybean in a sani and environment. *Production Agriculture and Technology, 3(2);* 117-123.

Sodangi, I.A., Gworgwor, N.A. and Joshua, S.D. (2011). Effect of interrow spacing on productivity of soybean (Glycine max) in Maidiguri. *Nigerian Journal of Weed Science, 19;* 23-40.

Tafera, H. (2011). Breeding for promiscuous soybean at IITA, soybean-molecular aspect of breeding. Dr Alekandra (eds) ISBN 978-953-307-2400 x + in tech. Available http://www.intechopen.com/books/soybean-molecular-aspectofbreeding/breedingforpromiscuous-soybeanatIITA

Imoloame, E.O., Joshua, S.D. and Gworgwor, N.A. (2010). Economic assessment of some pre-emergence herbicides in the Sudan Savannah zone of Nigeria. *Journal of Agriculture, Biotechnology, Sustainable Development, 2(2);* 21-26.

Table 1: Effect of weed management methods on weed control (combined) attributes in soybean in 2016 and 2017 cropping season (combined)

Treatments	Weed density 8 WAP	Weed dry weight 8 WAP	% WCE 8 WAP	Weed density at harvest	Weed dry weight at harvest	% WCE at harvest
Unweeded check	509.2	86.4	-	196.4	169.2	-
Hoe weeding (3 WAP)	180.2	23.3	73.0	96.4	104.3	38.4
Hoe weeding (3 & 5WAP)	119.6	14.3	83.4	47.3	62.4	63.1
Hoe weeding (3, 5 & 7WAP)	0.00	0.00	100.0	29.2	30.4	82.0
Pendimethalin (1.16kg ai/ha)	167.3	18.4	78.7	56.2	76.2	55.0
Fusilade forte (0.23kg ai/ha)	189.2	20.3	76.5	83.4	98.2	42.0
Pend. + ful (1.16 + 0.23kg ai/ha	121.2	16.4	81.0	36.8	40.3	76.2
LSD (0.05)	16.1	9.6	8.0	2.07	19.4	92.0

Table 2: Effect of weed management methods on growth attributes of soybean in Mosogar in 2016 and 2017 cropping seasons (combined)

Treatments	Plant height 12WAP	Leaf nos/plant 12WAP	Leaf area/plant 12WAP	Branch nos/plant 10WAP
Unweeded check	43.79	12.8	1029.9	2.96
Hoe weeding (3 WAP)	59.41	20.18	1493.2	3.91
Hoe weeding (3 & 5WAP)	65.46	2.66	2313.4	4.61
Hoe weeding (3, 5 & 7WAP)	69.43	28.23	2415.8	5.22
Pendimethalin (1.16kg ani/ha)	52.51	23.76	1573.2	4.01
Fusillade forte (0.23kg ai/ha)	49.20	20.16	1339.4	3.01
Pend. + ful (1.16 + 0.23kg ai/ha	66.63	27.29	2215.8	4.96
LSD (0.05)	6.34	3.23	509.6	0.91

Table 3: Effect of weed management methods on yield and yield attributes of soybean in Mosogar in 2016 and 2017 cropping seasons (combined)

Treatments	Days to 50% flowering	No. of pods per/plant	Pod weight/plant (g)	100 seed weight	Grain yield kg/ha	Stover yield t/ha
Unweeded check	61.2	15.18	5.36	10.1a	430.4	0.91
Hoe weeding (3 WAP)	61.2	21.4	6.31	9.90a	967.8	1.51
Hoe weeding (3 & 5WAP)	61.2	46.3	11.2	9.89a	1201.3	1.97
Hoe weeding (3, 5 & 7WAP)	61.2	50.59	14.3	10.61a	1413.7	2.57
Pendimethalin (1.16kg ai/ha)	61.2	22.4	8.41	9.96a	1021.4	1.61
Fusillade forte (0.23kg ai/ha)	61.2	19.43	7.42	10.20a	930.3	1.34
Pend. + ful (1.16 + 0.23kg ai/ha	61.2	48.42	12.2	9.93a	1394.3	2.21
LSD (0.05)	NS	3.08	0.24	NS	147.9	0.21