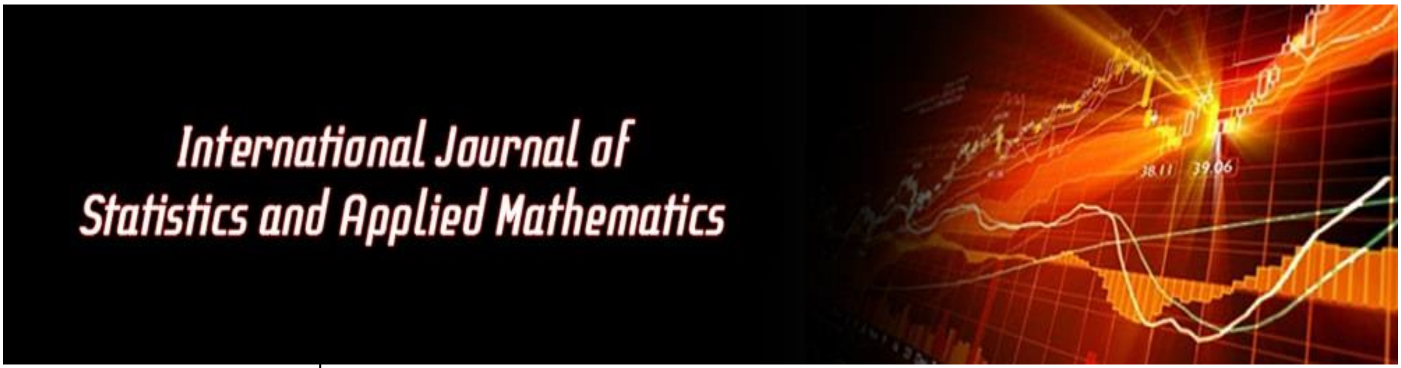
International Journal of Statistics and Applied Mathematics 2023; SP-8(5): 47-50



ISSN: 2456-1452
Maths 2023; SP-8(5): 47-50

https://www.mathsjournal.com
Received: 02-04-2023
Accepted: 07-05-2023

DP Singh
Krishi Vigyan Kendra, Maharajganj, Uttar Pradesh, India

Poonam Singh
Junjunwala PG Collage Ayodhya, Uttar Pradesh, India

RA Singh
Crop Research Station, (A.N.D.U.A.T.), Bahraich, Uttar Pradesh, India

Mahendra Singh
Crop Research Station (A.N.D.U.A.T.), Bahraich, Uttar Pradesh, India

N Parkash
Crop Research Station (A.N.D.U.A.T.),Ghaghraghat, Bahraich, Uttar Pradesh, India

PK Singh
Crop Research Station (A.N.D.U.A.T.), Bahraich, Uttar Pradesh, India

SKS Rajpoot
Crop Research Station (A.N.D.U.A.T.), Ghaghraghat, Bahraich, Uttar Pradesh, India

Raj Bahadur
Dean collage of Agriculture ANDUAT, Kumarganj Ayodhya, Uttar Pradesh, India

Corresponding Author:
RA Singh
Crop Research Station (A.N.D.U.A.T.), Bahraich, Uttar Pradesh, India

Evaluation of new post-emergence herbicides in eastern Uttar Pradesh

DP Singh, Poonam Singh, RA Singh, Mahendra Singh, N Parkash, PK Singh, SKS Rajpoot and Raj Bahadur

Abstract

A field experiment was conducted on sandy loam soil of conducted during the kharif season of 2020 and 2021 at A.N.D.U.A.T, Crop Research station, Bahraich to evaluate the performance of weed-control methods on weed dynamics and productivity of maize. The experiment was laid out in randomized block design with 9 treatments T_1-Weedy check, T_2-Weed free check, T_3-Atrazine 1000 g/ha (PE) fb Hand weeding at 25 DAS, T_4-Atrazine 750 g/ha (PE) fb Topramezone 25.2 g/ha at 25 DAS, T_5-Atrazine 750 g/ha (PE) fb Tembotrione 120 g/ha at 25 DAS, T_6-Atrazine 1000 g/ha (PE) fb Topramezone 25.2 g/ha at 25 DAS, T_7-Atrazine 1000 g/ha (PE) fb Tembotrione 120 g/ha at 25 DAS, T_8-Topramezone 25.2 g/ha + Atrazine 750 g/ha at 15 DAS and T-$_9$ Tembotrione 120 g/ha + Atrazine 750 g/ha at 15 DAS in three replication. The Treatment of T_5-Atrazine 750 g/ha (PE) fb Tembotrione 120 g/ha at 25 DAS, 6278 kg/ha and increase % was 133.12 followed by T_4-Atrazine 750 g/ha (PE) fb Topramezone 25.2 g/ha at 25 DAS, 6178 kg/ha & increase % 129.40. Application of T_5-Atrazine 750 g/ha (PE) fb Tembotrione 120 g/ha at 25 DAS recorded maximum B:C ratio (3.19) and Rs.95,567/ha, significantly higher net return compared to weedy check (0.80) Rs. 23867/ha than rest of the treatments.

Keywords: Weed, weed control, productivity treatments, randomized block design

Introduction

Maize (*Zea mays* L.) is the most versatile food crop of global importance. It ranks third most important food grain crop after rice and wheat in India providing food, feed, fodder and also serves as a source of basic raw material for number of industrial products for food (25%), animal feed (12%), poultry feed (49%), starch (12%), brewery (1%) and seed (1%) (Dass *et al*. 2008) [5]. In India, it is the third most important food crop after rice and wheat. It is grown in nearly 9.26 m ha with production of 23.67 mt and average productivity of about 2.57 t/ha compared to the world average productivity of 4.94 t/ha. The maize is cultivated for grain, fodder, green cobs, sweet corn, baby corn and popcorn in peri-urban areas. The average maize yield in the developed countries is more than 7 t/ha while in the developing countries it is only around 3 t/ ha (Dass *et al*. 2008) [5]. Amongst various production factors, weed management plays major role in increasing productivity of maize. Unchecked weed growth in crop may results in grain yield losses to the extent of 100% (Sharma 2005) [13]. Corn is the most versatile crop with wider adaptability to varied agro ecological regions and diverse growing seasons. Besides serving as human food and animal feed, the importance of this crop also lies in its wide industrial applications. For example, corn oil is used in margarine, corn syrup sweeteners in marmalade, and corn syrup solids in instant non-dairy coffee creamer. In addition, corn is fed to cows, chickens, and pigs, which produce milk, eggs, and bacon, respectively. Furthermore, corn finds application in a candy bar, a beer or bourbon whisky, a hamburger, industrial chemicals, ethanol in gasoline, plastics, and in the paper sizing of a glossy magazine (Wilkes G 2004) [18]. Responding to its multiple uses, the demand for corn is constantly increasing in the global market. New production technologies, such as improved hybrid cultivars, precision agriculture, herbicide-resistant traits, and bio-technological innovations, such as drought-tolerant corn, offer great promise for increasing corn productivity to meet the growing demand.

Globally, corn is grown on more than 175 million ha across 166 countries with a production of around 880 million t (Anonymous (2013a) [3]. The global output of corn in 2013was forecast at about 963 million t, 10% up from 2012 (Anonymous (2013a) [3]. Excluding environmental variables, yield losses in corn are caused mainly by competition with weeds. Weed interference is a severe problem in corn, especially in the early part of the growing season, due to slow early growth rate and wide row spacing. Weeds compete with the corn plants for resources such as light, nutrients, space, and moisture that influence the morphology and phenology of crop, reduce the yield, make harvesting difficult, and mar the quality of grains. Furthermore, high weed infestation increases the cost of cultivation, lowers value of land, and reduces the returns of corn producers. In order to realize the yield potential of corn, weed management becomes indispensable. These factors vary across regions and influence the composition and number of predominant weeds of economic importance to corn production (Kremer RJ 2004) [9]. The critical period may be defined as the time period after crop emergence during which crop must be kept weed-free to prevent yield losses, described as losses greater than 5% in earlier studies (Hall MR *et al*. 1992 and Van Acker RC *et al*. 1993) [6, 17]. Weeds that emerge at the time of crop germination or within a few days of crop emergence cause greater yield loss than weeds emerging later in the growing season (Knezevic SZ *et al*. 1994, Donovan JT, *et al*. 1985 and Swanton CJ, *et al* 1999) [8, 12, 15]. Weeds regularly cause devastating maize crop losses (Bajwa *et al*., 2015) [1]. For example, they account on average for 50–90% of crop loss in Africa (Chikoye *et al*., 2005) [5]. Weed management in Uttar Pradesh suffers from low use of herbicides and mineral fertilizers, in addition to lack of available labour for weeding, often resulting in delays that defer weeding past the stage where it is possible to prevent economic damage (Nyamangara *et al*., 2014, Nyanga *et al*., 2012) [7, 19]. Some researchers have recommended the use of herbicides as being economical compared to mechanical weed control (Gianessi, 2014, Muoni *et al*., 2013) [10, 16]. However, the over reliance on herbicides in developed regions has led to increased levels of resistance in certain weed species (Culpepper *et al*., 2004, Hall *et al*., 2014) [2, 11], making the use of herbicides more and more questionable now and in the future. The post emergence herbicide could be equally good or better than pre-emergence applications because in case of pre emergence spray if the residual effects are no longer then, post-emergence sprays could be better option. In post-emergence application, the use of herbicides at reduced doses is one of the most important tools to limit herbicide input into the environment according to the integrated weed management system (Zhang *et al*., 2013) [20]. The experiment was designed with the view to find out the effect of herbicides and their combination on productivity of maize.

Materials and Methods

A experiment was carried out to assess the weed management experiments were carried out to find out best herbicide based solutions for addressing shortages of labour and escalating wages. It was found that weed caused mean yield losses of. The experiment at Crop Research Station, (ANDUAT), Bahraich, which is situated at 28.24 & 27.4 latitude & 81.65 to 81.3 eastern longitude. Main cropping system in the district of Paddy / Maize - Wheat / Lentil, maize - wheat, maize – lentil. Climate of the research station is hot & humid. The maximum & minimum temperature ranges between 44 C & 5 C. The average rainfall is 1125 mm. The main crop is Bahraich district was Paddy / Maize - Wheat, maize - wheat, maize – lentil. Soil of the experimental field is sandy loam with pH 7.2. The experiment was laid out in a randomized block design with 9 treatments, T_1-Weedy check, T_2-Weed free check, T_3-Atrazine 1000 g/ha (PE) fb Hand weeding at 25 DAS, T_4-Atrazine 750 g/ha (PE) fb Topramezone 25.2 g/ha at 25 DAS, T_5-Atrazine 750 g/ha (PE) fb Tembotrione 120 g/ha at 25 DAS, T_6-Atrazine 1000 g/ha (PE) fb Topramezone 25.2 g/ha at 25 DAS, T_7-Atrazine 1000 g/ha (PE) fb Tembotrione 120 g/ha at 25 DAS, T_8-Topramezone 25.2 g/ha + Atrazine 750 g/ha at 15 DAS and T_9-Tembotrione 120 g/ha + Atrazine 750 g/ha at 15 DAS in three replications. Fertilizers were applied uniformly through urea, DAP and MOP at 200, 60 and 50 kg N, P_2 O5 and K_2 O ha-1, respectively. As per the treatments, pre-emergence herbicides were sprayed uniformly with knapsack sprayer at discharge rate of 500 l ha^{-1} on the same day of sowing at ideal moisture conditions. At 25 days after sowing the post-emergence herbicides were applied as per the treatments and hand weeding was carried at 20 and 40 days after sowing in weed free treatment. The data was recorded thrice at 25, 50 DAS and at harvest on weeds and at harvest on crop. Observations on weed density and weed dry matter were recorded by using quadrate method. The data on number of weeds and weed dry matter were subjected to square root transformation before statistical analysis. The cost economics were worked out for different weed control treatments. The grain yield was recorded at harvest. Economics was calculated on the basis of prevailing market prices of inputs and produce. The data on grain yield of each plot were recorded separately by threshing the harvested maize crop. Grain yield separately recorded the mean value of percentage increase over weedy check yield.

Results and Discussion

The experimental field was infested with *Cynodon dactylon*, *Digitaria sanguinalis*, *Dactyloctenium aegyptium*, *Echinocloa* spp and *Rottboellia exaltata* among grasses; *Parthenium hysterophorus*, *Commelina benghalensis*, *Amaranthus viridis*, *Euphorbia geniculata*, *Digera arvensis* and *Trianthema portulacastrum* among the broad-leaved weeds and sedge *Cyperus rotundus*. It is apparent from Table 1 that the results with various treatments were significantly different from the weedy check, benefits cast ratio were work out (Samui *et al*., 2000) [21]. The lowest yield of maize was recorded weedy check plot 2693 kg/ha. The Treatment of T_2-weed free were recorded maximum grain yield 6413 kg/ha increased the yield of 138.13% over weedy check followed by T_5-Atrazine 750 g/ha (PE) fb Tembotrione 120 g/ha at 25 DAS, 6278 kg/ha and increase % was 133.12. Other treatment grain yield was T4-Atrazine 750 g/ha (PE) fb Topramezone 25.2 g/ha at 25 DAS, 6178 kg/ha & increase % 129.40, T_3-Atrazine 1000 g/ha (PE) fb Hand weeding at 25 DAS, 6162 kg/ha & increase % 128.81, T_7-Atrazine 1000 g/ha (PE) fb Tembotrione 120 g/ha at 25 DAS, 6067 kg/ha & increase % 126.40, T6-Atrazine 1000 g/ha (PE) fb Topramezone 25.2 g/ha at 25 DAS, 5838 kg/ha & increase % 116.67, T_8-Topramezone 25.2 g/ha + Atrazine 750 g/ha at 15 DAS, 5822 kg/ha & increase % 116.19 and T-9Tembotrione 120 g/ha + Atrazine 750 g/ha at 15 DAS, 5753 kg/ha & increase % 113.62. Application of T_5-Atrazine 750 g/ha (PE) fb Tembotrione 120 g/ha at 25 DAS recorded maximum B:C ratio (3.19) and Rs.95,567/ha, significantly higher net return compared to weedy check (0.80) Rs. 23867/ha. Similar results reported (Sidhu *et al*. 2014) [14] also reported. Continuous uses of selective herbicide like atrazine for both pre and post emergence weed control may result in development of resistant biotypes. This calls for new molecules like tembotrione offers better weed control to avoid shift in the weed flora and as a post-emergence compared to earlier recommendation of atrazine as preemergence only and from the results it could be concluded. The second year almost consistent results suggested that these new herbicide molecule based weed management could help in enhancing productivity and profitability of maize production under changing scenario of labour availability.

It was concluded that for higher productivity, profitability and effective weed control in maize T5-Atrazine 750 g/ha (PE) fb Tembotrione 120 g/ha at 25 DAS as can be applied in Uttar Pradesh.

Table 1: Yield and economics of maize as influenced by weed management methods

Treatment	Grain yield (kg/ha)	Increase % over weedy check	Cob yield (kg/ha)	Plants ('000/ha)	Cobs ('000/ha)	Net returns (Rs./ha)	BC ratio
T1-Weedy check	2693	-	2675	81.7	82.0	23867	0.80
T2-Weed free check	6413	138.13	6499	81.6	82.0	96267	3.01
T3-Atrazine 1000 g/ha (PE) fb Hand weeding at 25 DAS	6162	128.81	6286	82.2	82.1	93233	3.11
T4-Atrazine 750 g/ha (PE) fb Topramezone 25.2 g/ha at 25 DAS	6178	129.4	6201	82.0	82.0	91567	2.86
T5-Atrazine 750 g/ha (PE) fb Tembotrione 120 g/ha at 25 DAS	6278	133.12	6358	82.1	81.9	95567	3.19
T6-Atrazine 1000 g/ha (PE) fb Topramezone 25.2 g/ha at 25 DAS	5835	116.67	5837	81.6	81.8	84700	2.65
T7-Atrazine 1000 g/ha (PE) fb Tembotrione 120 g/ha at 25 DAS	6097	126.4	6161	81.9	82.1	91933	3.06
T8-Topramezone 25.2 g/ha + Atrazine 750 g/ha at 15 DAS	5822	116.19	6247	82.1	82.2	84447	2.64
T-9Tembotrione 120 g/ha + Atrazine 750 g/ha at 15 DAS	5753	113.62	6310	82.1	81.9	85067	2.84
Mean	5692.5	-	5841.5	81.9	82.0	82960.9	2.68
C D	384.5	-	87.0	0.3	0.8	5587.1	0.18
C V (%)	3.9	-	0.9	0.2	0.6	3.9	3.9
Significance	S	-	S	S	NS	S	S

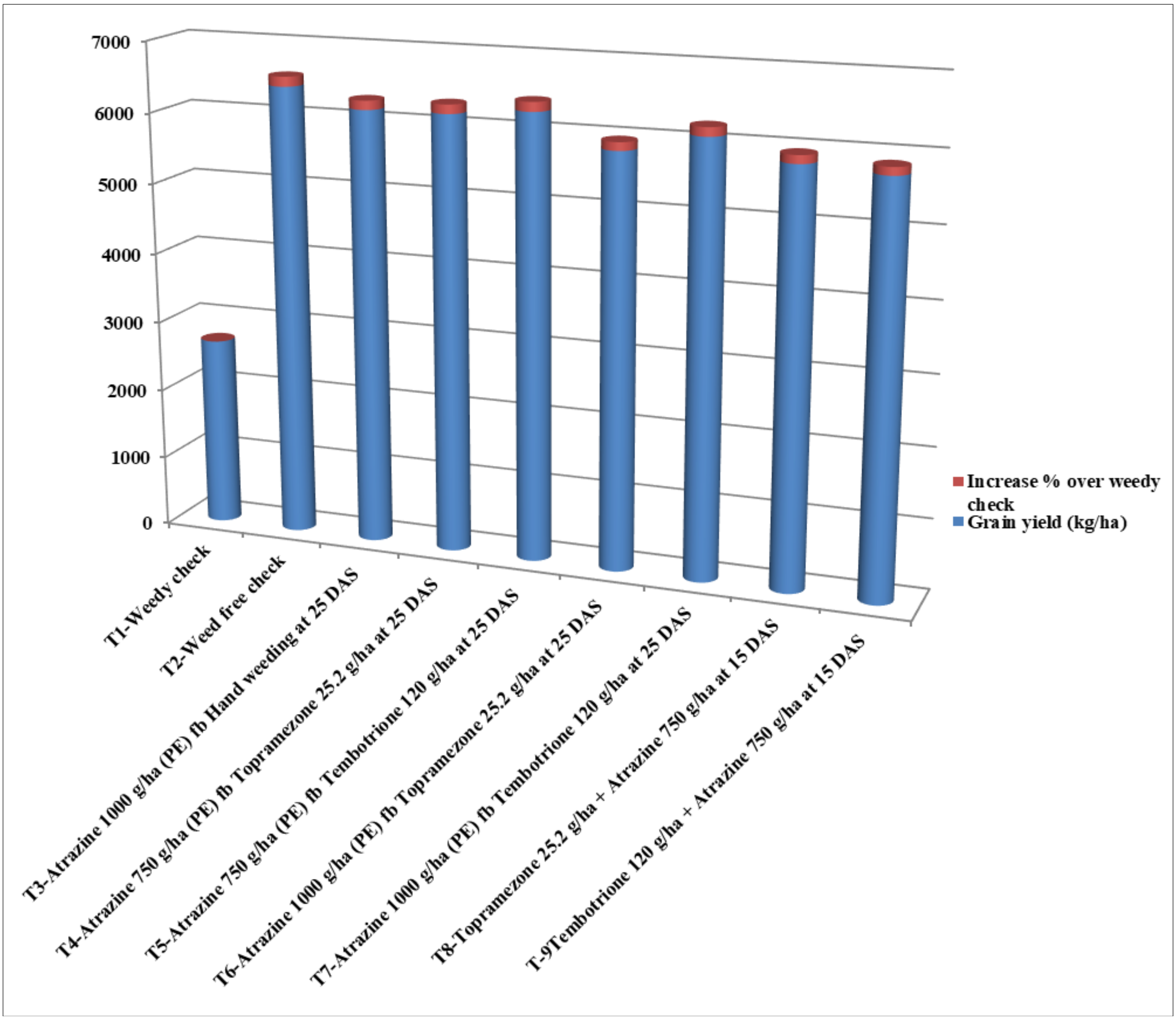


Fig 1: Yield and increase % of maize as influenced by weed management methods

References

1. Bajwa AA. Nonconventional weed management strategies for modern agriculture Weed Sci; c2015.
2. Culpepper AS. Tropical spiderwort (*Commelina benghalensis*) control in glyphosate-resistant cotton Weed Technol; c2004.
3. Anonymous Food outlook-biannual report on global food markets; c2013a. (June 2013). http:// www.fao.org/docrep/018/al999e/al999e.pdf. Accessed 7 Nov 2013.
4. Narang KK, Jha SK. Effect of weed management on weed dynamics, crop growth, fodder yield and economics of fodder maize (*Zea mays* L.) African tall under Chhattisgarh condition. Int. J Adv. Chem. Res. 2022;4(2):235-241. DOI: 10.33545/26646781.2022.v4.i2d.104
5. Dass S, Jat ML, Singh KP, Rai HK. Agro-economic analysis of maize based cropping system in India. Indian Journal of Fertilizers. 2008;4:49-62.
6. Hall MR, Swanton CJ, Anderson GW. The critical period of weed control in grain corn. Weed Sci. 1992;40:441-447.
7. Nyamangara J. Weed growth and labor demand under hand-hoe based reduced tillage in smallholder farmers field in Zimbabwe Agric. Ecosyst. Environ; c2014.
8. Knezevic SZ, Weise SF, Swanton CJ. Interference of redroot pigweed (*Amaranthus retroflexus*) in corn (*Zea mays*). Weed Sci. 1994;42:568-573.
9. Kremer RJ. Weed control. In: Smith CW, Betran J, Runge ECA (eds) Corn: origin, history, technology and production. Wiley, Hoboken; c2004. p. 717-752.
10. Gianessi L. Importance of Herbicides for Conservation Agriculture in Sub-Saharan Africa (case study 102 2014).
11. Hall LM. Survey of glyphosate-resitant kochia (*Kochia scoparia* L. Schrad.) in Alberta Can. J Plant Sci; c2014.
12. O'Donovan JT, de St. Remy EA, O'Sullivan PA, Dew DA, Sharma AK. Influence of wild oat (Avena fatua) on yield loss of barley (Hordeum vulgare) and wheat (Triticum aestivum). Weed Sci. 1985;33:498-503.
13. Sharma R. Integrated weed management in Kharif maize. Intensive Agriculture May-June: 6-9; c2005.
14. Sidhu AS, Singh J, Saini SP, Kumar V. Chemical control of hardy weeds in Kharif maize at farmers fields in Punjab, p. 304. In: Emerging Challenges in Weed Management, Biennial conference of Indian Society of Weed Science,15- 17 February 2014, DWSR, Jabalpur; c2014.
15. Swanton CJ, Weaver S, Cowan P, Van Acker R, Deen W, Shreshta A. Weed thresholds: theory and applicability. J Crop Prod. 1999;2:9-29.
16. Muoni T. Weed Control in conservation agriculture systems of Zimbabwe: indentifying best strategies, Crop Prot; c2013.
17. Van Acker RC, Swanton CJ, Weise SF. The critical period of weed control in soyabean [*Glycine max* (L.) Merr. Weed Sci. 1993;41:194-200.
18. Wilkes G. Corn, strange and marvelous: but is a definitive origin known? In: Smith CW, Betran J, Runge ECA (eds) Corn: origin, history, technology and production. Wiley, Hoboken; c2004. p. 3-64.
19. Nyanga PH. Food security, conservation agriculture and pulses: Evidence from smallholder farmers in Zambia. Journal of food Research. 2012 May 1;1(2):120.
20. Zhang X, Wang H, He L, Lu K, Sarmah A, Li J, *et al*. Using biochar for remediation of soils contaminated with heavy metals and organic pollutants. Environmental Science and Pollution Research. 2013 Dec;20:8472-83.
21. Samui RC, Ambhore SB. Efficacy of polythene mulch technology in improving growth and yield of postrainy season groundnut in West Bengal, India. International Arachis Newsletter. 2000(20):84-6.
22. Chikoye D. Evaluation of a new formulation of atrazine and metolachlor mixture for weed control in maize in Nigeria Crop Prot; c2005.