The Pharma Innovation Journal 2022; 11(6): 2269-2273

www.ThePharmaJournal.com

The Pharma Innovation

ISSN (E): 2277-7695
ISSN (P): 2349-8242
NAAS Rating: 5.23
TPI 2022; 11(6): 2269-2273

www.thepharmajournal.com
Received: 06-02-2022
Accepted: 16-05-2022

Kethavath Shivudu Nayak
Department of Agronomy, School of Agriculture, lovely, Professional University, Punjab, India

Corresponding Author:
Kethavath Shivudu Nayak
Department of Agronomy, School of Agriculture, lovely, Professional University, Punjab, India

Influence of nitrogen levels and weed control methods on the growth of kharif maize (*Zea maize* L.) and associated weeds

Kethavath Shivudu Nayak

Abstract
The field experiment entitled "Influence of nitrogen levels and weed control methods on the growth of *kharif* maize (*Zea mays* L.) and associated weeds". was carried out during kharif 2021 at Agronomy research farm, Lovely Professional University, Phagwara, Punjab. Fifteen treatment combination of three levels of nitrogen (150 kg N/ha, 125 kg N/ha and 100 kg N/ha.) in main plots and five weed control treatments *viz*., T1: Laudis 42% SC (tembotrione) 100g a.i/ha, post emergence, T2: Atrazine 1.0 kg a.i/ha, pre-emergence followed by hand weeding, T3: Black polythene mulch, T4: Two hand weedings, T5: Unweeded (control) in sub plots. The experiment was laid out in in Split Plot Design with four replications. Results showed that significantly low weed count and dry matter accumulation was observed in two hand weeding and black mulch treatments as compared to un-weeded (control). Among nitrogen levels highest weed count (1sq.m) and dry matter (q/ha) were found in 150 kg N/ha which was at par with 125 kg N/ha. In case of yield attributes cob girth, cob length and 1000 seed weight were significantly higher in two hand weeding and atrazine 1.0 kg/ha, pre- em. f.b hand weeding as compared to un-weeded control plots. The grain yield in 150 kg N/ha (58.1 q/ha) was significantly superior when compared to 100 kg N/ha which was at par with125 kg N/ha (57.8 q/ha). In sub plot treatments, significantly higher grain yield was recorded in two hand weeding (60.19 q/ha) and integrated weed management treatment i.e. atrazine pre-em. f.b hand weeding (58.1 q/ha) when compare to other weed control treatments. stover yield in nitrogen levels of 150 kg N/ha (137.82 q/ha) was at par with 125 kg N/ha (134.2 q/ha) and both these treatments were significantly superior to 100 kg N/ha. In case of weed control treatments, Stover yield in two hand weeding (151.56 q/ha) and atrazine 1.0 kg a.i/ha, pre-emergence followed by hand weeding (123.28 q/ha) was significantly higher than other weed control treatments.

Keywords: Nitrogen, weeds, kharif, management, *Zea maize* L.

Introduction
Maize (*Zea mays* L.) is third most important crop after rice and wheat in the world. It possesses the highest yield potential among the cereals, that is why known as queen of cereals. It belongs to Poaceae family and originated in Mexico and South America. In India major maize growing States are Karnataka, Madhya Pradesh, Maharashtra, Rajasthan, Bihar, Uttar Pradesh, Telangana, Gujarat, and Tamil Nadu. In Punjab during 2019-2020, a total of 410.5 tonnes of maize was produced from an area of 114.6 hectares and average yield of 3582 kg/ha (Anonymous, 2021). Maize is cultivated all over the year in India. During *kharif* season it occupies predominantly 85% of the area under cultivation as compared to the other seasons (Apeda). In this crop, the content of essential amino acids *viz*., leucine and isoleucine are high while lysine and tryptophan is low. Maize crop is infested with a wide variety of weeds like *Echinochloa colona, Cyperus rotundus, Cynodon dactylon, Commelina benghalensis, Amaranthus Viridis, Digeraarvensis and Trianthema portulacastrum* dominate during early stages of the crop growth and toward the tasseling and maturity of the crop. Different types of weed species and their densities leads to corn yield loss. Weeds compete with crops for all growth factors including nutrients, soil moisture, light, space, etc. These should be controlled during early stages of crop growth i.e. at critical period of crop weed competition which lies between 3-5 weeds after sowing the maize crop. Weed competition has resulted in maize production losses ranging from 51 to 100 percent in Nigeria. (Akobundu and Ekeleme 2000) [4]. Evans *et al*. (2003) [14] revealed that as the length of weed interference increased, the number of ears per plant and the 100-seed weight of grains fell linearly. In maize weeds can be controlled with chemical, mechanical, cultural, or integrated method of weed control.

Maize is a nutrient- hungry plant with high nutritional needs. Nitrogen fertiliser has a higher requirement than other nutrients. The deficiency of nitrogen during the tasselling and silking stage significantly affects the crop yield. Shrestha J, *et al*., (2018) [21]. The amount of nitrogen to apply to maize plants, on the other hand, is determined by maize variety, soil type, crop fertility status, location, and yield potential of variety/hybrid. (Singh *et al*., 2002) [22]. It is reported that grater N uptake by weeds as compared to corn with increase in nitrogen level. Weed infestation is greater at higher levels of N. because weeds have superior efficiency of N uptake Synthetic fertilizers, on other hand, are more popular due to their deep roots of maize and quick way to adjust the soil nutrient deficits and hence higher yields, but their over usage causes the pollution and harms the ecosystem and raises production costs (Hearn 2014) [16]. The effects of nitrogen on crop–weed competition have yielded mixed outcomes in research. Several studies have shown that addition of nitrogen has increased the competitive ability of weeds greater than maize and its yield remain unchanged/decreased in certain cases. (Barker *et al*., 2006) [9].

Materials and Methods

This study was carried out at the research farm of the Department of Agronomy, Lovely Professional University, Phagwara, Kapurthala district during the *kharif* session of 2021.which is situated in the sub-tropical agro climate zone in central plains of Punjab State. The farm is located exactly between geographical co-ordinates of 31^0 22' 31.81" North latitude and $75^0$23'03.02" east latitude at an altitude of 252 m above mean sea level, and 20 km away from Jalandhar city in Punjab. The region belongs to alluvial types with sandy loam texture. Samples of soil were collected from 0- 15 cm depth before the conduct of experiment from research area. Soil properties of experiment field (pH 8.22), EC mhos/cm (0.16), Organic carbon (0.35%), available (N) kg/ha (401.1), available (P) kg/ha (20.5) and available (K) kg/ha (220.5). The experiment consisted of fifteen treatment combination of three levels of nitrogen (150 kg N/ha, 100 kg N/ha and 100 kg N/ha.) in main plots and five weed control treatments *viz*., T1: Laudis 42% SC (tembotrione) 100 g a.i/ha, post emergence, T2: Atrazine 1.0 kg a.i/ha, pre- emergence followed by hand weeding, T3: Black polythene mulch, T4: Two hand weedings, T5: Unweeded (control) In sub plots. The experiment was laid out in in Split Plot Design. with four replications, Size of the experimental plots are 6M X 3M. Variety used in experiment was PMH 13, sown at the seed rate of 20 kg/ha with row to row 60 cm and plant to plant spacing of 20 cm. After harvesting the succeeding crop, field was prepared by discing (once), tillering (twice) and planking (one) with a tractor. Gross area was measured by measuring tape and divided into small plots manually according to experiment design and number of treatments, Once after getting the fine tilth, the entire plot was divided into 60 plots of even size of predetermined dimensions. Fertilizer application Single super phosphate (16% phosphorous) at 62.5 kg/ha of P_20_5 and murate of potash (60% potassium) at 30 kg/ha of K_20 and 1/3rd of nitrogen (urea 46%) as per treatment was applied as basal dose with placement method and remaining dose of urea was applied in two splits on 20-6-2021 and 4-8-2021. As per treatment pre-emergence application of atrazine at 1.0 kg/ha. was made within 24 hours after sowing after mixing in 500 lit. of water/ha. and post emergence application of tembotrione (Laudis 42%SC) 110 g a.i/ha was made 30 DAS, after dissolving in 500 lit/ha of water with hand operated knap sack sprayer. Hand weeding was done manually by using khurpa – a small tool at 30 days after sowing in subplot of each main plot and 30 DAS and 60DAS. Black polythene (15µm) sheets were spread in sub plots according to treatments. Seeds were placed in soil and remaining area of plot was covered with black plastic mulch. A quadrat of 30cm × 30cm was thrown twice in every subplot randomly and noted average count of both weeds' species (grassy and broad) at 30, 60 DAS and at harvest and weed dry matter was observed at an interval of 30, 60 DAS and at harvest with a quadrat of 1sq feet (30cmX30cm) at two different places by cutting the weeds above ground level and after sun dryimg these were dried in the oven at 55^0C. ± 3^0C temperature till complete dryness. After dryimg their weight was recorded. The term weed control efficiency is expressed in percentage and calculated at harvest. only It indicates the effective treatment to control weed infestation on weed biomass basis over the control or weedy treatment Higher values indicates the effectiveness of a treatment.

$$WCE\ (\%) = \frac{X-Y}{X} \times 100$$

X= Dried weight of weeds in weedy check plot
Y= Dried weight of weeds in treatment for which WCE is to be calculate

The growth and yield attributes were recorded at the time of harvest. Net plot harvested was 3 sqm.

Result and Discussion

1. Weed Density

The weed density in 150 kg N /ha was 24.53 m^2 which was significantly higher when compared to 100 kg N/ha and on par with 125 kg N /ha with weed count of 22.74 m^2. (Table 1) Minimum weed count was observed in 100 kg N/ha (17.87m^2). Dewangan *et al*., (2016) [12] also find similar results. In weed control treatments significantly higher weed density in un-weeded check treatment (43.89 m^2). Lowest weed density in two hand weeding was 6.43 m^2 was at par with black polyethene (8.88 m^2). The difference in black plastic mulch and two hand weeding treatment being non-significant. Similar findings were reported by Sheela Barla *et al*., (2016).

The total weed dry matter in 150 kg N/ha was 8.31 q/ha which was at par with 125 kg N /ha (8.08 q/ha). (Table 1) Minimum weed dry matter was observed in 100 kg N /ha (7.88 q/ha), which was significantly less than 125 kg N/ha and 150 kg N/ha. Soleymani *et al*., (2014) [23] are also found similar results. In un weeded control treatment was 26.07 q/ha which was significantly higher when compared to all other weed control treatments. The lowest weed dry matter was recorded in black mulch (0.36 q/ha) which was at par with two hand weeding (0.46 q/ha) and atrazine 1.0 kg/ha, pre-emergence f.b hand weeding (0.57 q/ha). Similar results found by Srividya *et al*., (2011) [24] and Saima Hashim *et al*., (2013) [15]

Highest weed control efficiency was found in 100 kg N /ha (69.77%) followed by 125 kg N/ha (69.00%) and lowest weed control efficiency of 68.12% was found in 150 kg N /ha.

(Table 1) Among the weed control treatments highest weed control efficiency was found in two hand weeding (98.61%) which was followed by black plastic mulch (98.23%) and atrazine 1.0 kg/ha f.b. hand weeding treatment (97.81%). Lowest weed control efficiency was found in post emergence application of Laudis 42% SC (tembotrione) 100 g a.i/ha (47.1%). Similar results found by Dewangan *et al*., (2016) [12],

Table 1: Effect of nitrogen levels and weed control treatments on weed count per square meter, dry matter (q/ha) and weed control efficiency (%).

	Total weed count/ m^{-2}	Dry matter accumulation (q/ha)	WCE
Main plot treatments	**90 DAS**	**90 DAS**	**90 DAS**
100 Kg N/ha	17.87	7.88	69.77
125 Kg N/ha	22.74	8.08	69.00
150 Kg N/ha	24.53	8.31	68.12
CD at 5%	NS	0.21	NA
Sub plot treatments			
T1- Laudis 42% SC (tembotrione) 100 g a.i/ha, post-em.	38.73	13.11	47.1
T2 -Atrazine 1.0 kg a.i/ha, pre-em. f.b hand weeding.	10.76	0.57	97.81
T3 - Black polythene mulch	8.88	0.46	98.23
T4- Two hand weeding	6.43	0.36	98.61
T5 - Unweeded (control)	43.89	26.07	
CD at 5%	8.88	0.46	NA
C.D. Interactions	NS	NS	

Table 2: Effect of nitrogen levels and weed control treatments on plant height (cm), number of leaves/plant and plant dry matter (gm).

	Plant height (cm)	No. of leaves/ plant	Plant dry matter (gm)
Main plot treatments	**At harvest**	**At harvest**	**At harvest**
100 Kg N/ha	201.30	15.08	648.14
125 Kg N/ha	209.05	15.94	662.58
150 Kg N/ha	211.20	16.36	668.52
CD at 5%	5.29	0.79	3.51
Sub plot treatments			
T1- Laudis 42% SC (tembotrione) 100 g a.i/ha, post-em.	207.12	15.36	706.06
T2 -Atrazine 1.0 kg a.i/ha, pre-em. f.b hand weeding.	212.87	16.83	716.37
T3 - Black polythene mulch	200.16	15.33	699.36
T4- Two hand weeding	217.58	17.77	717.93
T5 - Unweeded (control)	198.16	13.67	459.01
CD at 5%	10.50	1.14	4.96
C.D. Interactions	NS	NS	NS

2. Growth attributes

The plant height in 150 kg N/ha was 211.20 cm which was significantly higher when compared to 100 kg N/ha. Minimum plant height was observed in 100kg N/ha (201.30 cm) (Table 2). which was significantly less than other nitrogen levels. Similar results are also found by Effa *et al*. (2011) [13], Amanullah *et al*., (2009) [6]. Among weed control treatment, plant height was significantly increased in two hand weeding and atrazine pre-em. f.b hand weeding as compared to other weed control treatments. Rao *et al*., (2009) [19] also found similar results.

The number of leaves in 150 kg N/ha were 16.36 which were significantly higher when compared to other nitrogen levels (Table 2). Application of nitrogen at 125 kg N/ha recorded significantly higher number of leaves / plant than 100kg N/ha. Baloch, (2020) [8] also found the similar results. Among weed control treatments, maximum number of leaves were found in two hand weeding (17.77) and atrazine pre-em. f.b hand weeding was 16.83. both these treatments are significantly higher number of leaves than other weed control treatments. Sheela Barla *et al*., (2016) also found similar results.

The plant dry matter with 150 kg N/ha was 668.52 g per plant which was significantly higher when compared to other nitrogen levels. The 125 kg N/ha level recorded significantly lowest dry matter accumulation per plant than 150kg N/ha and significantly higher dry matter/ plant than 100 kg N/ha (Table 2). Amanullah *et al*., (2009) [6] also found similar results. Among weed control treatments, higher plant dry matter was found in two hand weeding (717.93g) which was at par with atrazine pre-em. f.b hand weeding was 716g. both these treatments are significantly higher number of leaves than other weed control treatments. Similar results are also found by Babiker *et al*., (2015) [7] and Akmal *et al*., (2010) [3].

3. Yield attributes

The cob girth in 150 kg N/ha was 4.61cm which was significantly superior when compared to 100 kg N/ha and at par with125 kg N/ha (4.52 cm). (Table 3) Minimum cob girth was observed in 100 kg N/ha (4.31 cm). The results are accordance with those reported by Woldesenbet and Haileyesus, (2016), Oktem and Oktem (2005). In weed control treatments in two hand weeding was 4.79 cm and atrazine 1.0 kg/ha, pre-emergence f.b hand weeding recorded cob girth of 4.64 cm and minimum cob girth was observed in un weeded check (4.18 cm). The same conclusion was mentioned by Sheela Barla *et al*., (2016).

The cob length in 150 kg N/ha and 125 kg N/ha was found to be at par and these treatments were significantly superior to 100 kg N/ ha (Table 3). Woldesenbet and Haileyesus, (2016) [25]; Akmal *et al*., (2010) [3] they also found that increase in N n weed control treatments, longest cob length (19.87 cm) was obtained by the plots with two hand weeding and shortest cob

length (15.58 cm) was observed in weed control plots. Sheela Barla *et al*., (2016), Rao *et al*., (2009) [19].

The test weight in 150 kg N/ha (264.9 g) was significantly superior to 100 kg N/ha and at par with 125 kg N/ha (260.9 g) (Table 3). The minimum test weight was observed in 100 kg N/ha (244.85 g). Saeed (2018) [20], Akram *et al*. (2010) [5] they also found that as increase in N increases in 1000 grain weight. In weed control treatments highest 1000 grain weight (275.83g) was obtained in the plots with two hand weeding and atrazine 1.0 kg a.i/ha, pre-em. f.b. hand weeding (266.16 g) and lowest 1000 grain weight (238.83 g) was observed in weed control plots. Similar results were found by Sheela Barla *et al*., (2016), Rao *et al*., (2009) [19].

4. Grain and stover yield (q/ha)

For nitrogen levels the grain yield[1] in 150 kg N/ha (58.1 q/ha) was significantly superior when compared to 100 kg N/ha (52.41 q/ha) which was at par with125 kg N/ha (57.8 q/ha) (Table 4). The minimum grain yield was observed in 100 kg N/ha (52.41 q/ha) which was significantly inferior than 150 and 125 kg N/ha. Baloch, (2020) [8], Woldesenbet & Haileyesus, (2016) [25], Amanullah *et al*., (2009) [6] are also found similar results. In sub plot treatments highest yield was recorded in two hand weeding (60.19 q/ha) and integrated weed management treatment i.e. atrazine. pre-em. f.b hand weeding (58.1 q/ha) which was significantly more than Laudis 42% SC (tembotrione) 100 g a.i/ha (56.3 q/ha) and black plastic mulch treatment (54.8 q/ha). On contrary in un weeded check (control) treatment, the grain yield was 51.81 q/ha which was significantly inferior than all other weed control treatments. Similar results were found by Abdullahi *et al*., (2016) [1], Abouziena *et al*., (2007) [2].

Stover yield in 150 kg N/ha (137.82 q/ha). was at par with 125 kg N/ha (134.2 q/ha) and both these treatments were significantly superior to 100 kg N/ha. The minimum stover yield was observed in 100 kg N/ha (125.73 q/ha). Amanullah *et al*., (2009) [6], Saeed (2018) [20], In case of weed control treatments, stover yield in two hand weeding (162.32 q/ha) and atrazine 1.0 kg a.i/ha, pre-em. f.b hand weeding (143.28 q/ha) was significantly higher than Laudis and black plastic mulch. On contrary in un weeded check (control) treatment, the stover yield was 103.35 q/ha which was significantly inferior than all other weed control treatments. Abdullahi *et al*., (2016) [1], Akmal *et al*., (2010) [3].

Table 3: Effect of nitrogen levels and weed control treatments on cob length (cm) and cob girth (cm), 1000 grain weight.

Main plot treatments	Cob girth (cm)	Cob length (cm)	1000 grain weight
100 Kg N /ha	4.31	16.97	244.85
125 Kg N /ha	4.52	18.16	260.7
150 Kg N /ha	4.61	18.54	264.9
CD at 5%	0.13	0.45	6.93
T1 - Laudis 42% SC (tembotrione) 100g a.i/ha, post.em	4.42	18.05	253.08
T2 -Atrazine 1.0 kg a.i/ha, pre- em. f.b hand weeding.	4.64	18.60	266.16
T3 - Black polythene mulch	4.38	17.33	250.16
T4- Two hand weeding	4.79	19.87	275.83
T5 -Unweeded (control)	4.18	15.58	238.83
CD at 5%	0.14	0.32	4.43
C.D. Interactions	NS	NS	NS

Table 4: Effect of nitrogen levels and weed control treatments on grain yield and stover yield (q/ha)

Main plot levels	Grain yield (q/ha)	Stover yield (q/ha)
N1 - 100 Kg/ha	52.41	125.73
N2 - 125 Kg/ha	57.8	134.2
N3 - 150 Kg/ha	58.1	137.82
CD at 5%	1.07	5.03
Sub plot treatments		
T1-Laudis 42% SC (tembotrione) 100 g a.i/ha, post-em.	56.3	131.83
T2 -Atrazine 1.0 kg a.i/ha, pre-em. f.b. HW.	58.1	143.28
T3 - Black polythene mulch	54.8	122.16
T4- Two hand weeding	60.19	162.32
T5 -Un weeded (control)	51.81	103.35
CD at 5%	1.22	5.3
C.D. Interactions	NS	NS

Conclusion

From the experimental results it can be concluded that in *Kharif* maize the application of 125 to 150 kg N/ha provided optimum yield. Application of N at 150 and 125 kg/ha increased grain yield by 9.97% and 9.34% over 100 kg N/ha. Among weed control treatments, in two hand weeding and integration of atrazine f.b hand weeding significantly improved the growth, yield attributes of maize significantly over plastic mulch and post-em. Application of Laudis. Two hand weeding, integration of atrazine with hand weeding, post-em. Application of Laudis and black polythene mulch recorded 14.06%, 10.82%, 7.95 and 5.4% percent yield increase than un weeded (control) treatment.

References

1. Abdullahi S, Ghosh G, Dawson J. Effect of different weed control methods on growth and yield of maize (*Zea Mays* L.) Under rainfed condition in Allahabad. Journal of Agriculture and Veterinary Science. 2016;9(4):44-47.
2. Abouziena HF, El-Karmany MF, Singh M, Sharma SD. Effect of nitrogen rates and weed control treatments on maize yield and associated weeds in sandy soils. Weed technology. 2007;21(4):1049-1053.
3. Akmal M, Rehman H, Farhatullah MA, Akbar H.

Response of maize varieties to nitrogen application for leaf area profile, crop growth, yield and yield components. Pakistan Journal of Botany. 2010;2(3):1941-1947.
4. Akobundu IO, Ekeleme FE. Effect of method of *Imperata cylindrica* management on maize grain yield in the derived savanna of southwestern Nigeria. Weed Research. 2000;40:335-341.
5. Akram M, Ashraf MY, Waraich EA, Hussain M, Hussain N, Mallahi AR. Performance of autumn planted maize (*Zea mays* L.) Hybrids at various nitrogen levels under salt affected soils. Soil & Environ. 2010;29(1):23-32.
6. Amanullah Marwat KB, Shah P, Maula N, Arifullah SA. Nitrogen levels and its time of application influence leaf area, height and biomass of maize planted at low and high density. Pakistan Journal of Botany. 2009;41:761-768.
7. Babiker M, Mahgoub Babiker, Salah Mukhtar, Abdel Mohamed. Effects of nitrogen and weeding times on performance of maize (*Zea mays* L.). Agriculture and Veterinary Sciences, 2015;16-2:13.
8. Baloch NA, Kaleri AA, Laghari GM, Kaleri AH, Kaleri GS, Mehmood A. Effect of nitrogen levels and application scheduling on the growth and yield of maize. Journal of Applied Research in Plant Sciences (JOARPS). 2020;1(2):42-52.
9. Barker DC, Knezevic SZ, Martin AR, Walters DT, Lindquist JL. Effect of nitrogen addition on the comparative productivity of corn and velvetleaf (*Abutilon theophrasti*). Weed Sci. 2006;54(2):354-363.
10. Barla S, Upasani RR, Puran AN, Thakur R. Weed management in maize. Indian Journal of Weed Science. 2016;48(1):67–69.
11. Bindhani A, Barik KC, Garnayak LM, Mahapatra PL. Nitrogen management in baby corn (*Zea mays* L.). Indian J. Agron. 2005;52:135-138.
12. Dewangan PK, Yadava MS, Upasani RR, Barla S, Pankaj SC. Impact of weed management in maize (*Zea mays* L.). The Ecoscan. 2016;9:971-976.
13. Effa EB, Uwah FD, Ukeh AD. Yield response of popcorn (*Zea may* L. *var. everta*) to nitrogen and lime amendment in a southeastern rainforest environment of Nigeria. Ame. J. Plant Physiol. 2011;6:304-311.
14. Evans S, Knezevic S, Lindquist J, Shapiro C. Influence of nitrogen and duration of weed interference on corn growth and development. Weed Science. 2003;51(4):546-556.
15. Hashim S, Marwat KB, Saeed M, Haroon M, Waqas M, Shah F. Developing a sustainable and eco-friendly weed management system using organic and inorganic mulching techniques. Pakistan Journal of Botany. 2013;45(2):483-486.
16. Hearn S. 12th Asian Maize Conference and Expert Consultation on Maize for Food, Feed, Nutrition, and Environmental Security. Bangkok, Thailand; 2014 30th October–1st November.
17. Lagoke STO, Adeosun SO, Elemo KA, Chude VO, Shebayan JAY. Herbicide evaluation for the control of weeds in maize at Samaru. In Report on cereals research cropping scheme meeting held at IAR/ABU Samaru, Zaria, Nigeria, 1998, 90-91.
18. Oktem AG, Oktem A. Effect of nitrogen and inter row spaces on sweet corn (*Zea mays sacharata Sturt*) ear characters. Asian J Plant Sci. 2005;4:361-364.
19. Rao AS, Ratnam M, Reddy TY. Weed management in zero-till sown maize. Indian Journal of Weed Science. 2009;41(1and2):46-49.
20. Saeed M, Huang H, Ali M, Khattak MK, Huang Z, Zhang C. Growth dynamics of maize *(Zea mays* L.) And weeds in response to different nitrogen levels and weeding intervals. Pak. J. Bot. 2018;50(4):1343-1346.
21. Shrestha J, Yadav DN, Amgain LP, Sharma JP. Effects of nitrogen and plant density on maize (Zea mays L.) Phenology and grain yield. Current agriculture research Journal. 2018;6(2):175-182.
22. Singh NP, Singh RA. Scientific crop production. Press Graphics, Delhi-28, India. 2002.
23. Soleymani MJ, Mirshekari B. Effect of Planting Density and Nitrogen Rate on Weeds Biomass and Some of the Agronomic Traits in Grain Maize 640. Journal of Natural Product and Plant Resources. 2014;4:24-30.
24. Srividya S, Chandrasekhar K, Veeraraghavaiah R. Effect of tillage and herbicide use on weed management in maize (*Zea mays* L.). The Andhra Agricultural Journal. 2011;58(2):123-126.
25. Woldesenbet M, Haileyesus A. Effect of nitrogen fertilizer on growth, yield and yield components of maize (*Zea mays* L.) In Decha district, Southwestern Ethiopia. International Journal of Research-Granthaalayah. 2016;4(2):95-100.