ISSN: 2287-688X

Annals of
Plant Sciences

Volume 10, Issue 11(2021) pp. 4345-4349

Research Article

Response of Spacing and Weed Management on the Growth and Yield of Sweet Corn (*Zea Mays Saccharata*)

Raman. R and R. Krishnamoorthy

Department of Agronomy, Faculty of Agriculture, Annamalai University Annamalai Nagar, Tamil Nadu 608 0022Head, Department of Agriculture, AISECT

Abstract

A field experiment was carried out at the experimental farm of Annamalai University, Annamalai Nagar during *kharif* season of 2013 to study on the response of spacing and weed management practices on growth and yield of sweet corn (*Zea mays saccharata*).The experiment was laid out in split-plot design with three replication. The experiment comprised of four spacing (45x15 cm,45x30 cm,60x15cm and 60x30cm) as main plot treatments. The sub plot treatment comprised of six weed management practices (Pendimethalin@1 kg ha^{-1},Pendimethalin @ 1 kg ha $^{-1}$ +HW @20 DAS, Atrazine @ 1 kg ha $^{-1}$,Atrazine @ 1 kg ha $^{-1}$+HW @20 DAS , Hand weeding twice @20 and 40 DAS and unweeded control) .The predominant weed flora were *Cyperus rotantus*L., *Dacteloctenium aegyptium, Echinochloa colonum, Cynodon dactylon, Trianthema portulacastrum, Vernonia cinerea, Cleome viscosa and Eclipta alba.* Among the different spacings tested, 45x15 cm spacing crop effectively controlled the weed growth, weed DMP and nutrient removal by weeds. The crop growth components viz., plant height, LAI and DMP and yield components were increased in 60x30cm spacing. 45x15 cm spacing recorded least value of growth and growth components of sweet corn. In respect to the weed management practices, hand weeding twicw on 20 and 40 DAS significantly reduced the weed density, weed DMP and thereby increased the growth and yield components of sweet corn. The spacing of 60x30cm along with hand weeding twice at 20 and 40 DAS recorded the higher grain yield.

Keywords: Spacing,Weed Management,Sweet corn, *Zea mays saccharata*

Introduction

Maize (*Zea mays L.)* is a widely grown cereal crop in India, ranking third behind rice and wheat. It is the only food cereal crop that can be produced throughout the year and has a good yield. As a result, the name "Queen of Cereals" was given to it (Rajenderkumar *et al.*,1997). Over 170 nations are currently producing nearly 1147.7 million MT of maize on an area of 193.7 million ha, with an average yield of 5.75 tonnes per hectare (FAOSTAT,2020).Maize is planted on 3.90 lakh hectares in Tamil Nadu, with a yield of 28.34 lakh metric tonnes and an average productivity of 7257 kg ha-1. Sweet corn (*Zea mays saccharata*) is a maize cultivar that is the most popular vegetable crop in the United States. Sweet corn is the result of a naturally occurring recessive mutation in genes that control the conversion of sugar to starch inside the endosperm of the kernel, which contains 13 to 15% sugar. It also serves as a raw material for starch, protein, drinks,

***Corresponding Author:**
Raman. R;

DOI: http://dx.doi.org/10.21746/aps.2021.10.11.5

textiles, and the paper industry. According to USDA, maize is a versatile grain with the energy of 86 k cal, 19.02 g carbohydrate, 3.22 g sugars, 27.0 g fibre, 1.18 g fat, 0.52 mg iron, 270 mg potassium and 37.0 mg magnesium. Crop geometry is a significant factor in vegetative development, grain output, and other aspects of sweet corn. Plant density rose from 55,000 to 89,000 plants per hectare, increasing grain yield from 10.1 to 10.8 t/ha (Abuzar *et al*., 2011). Weed competition occurs during the early stages of crop development, before the crop canopy has become dense enough to smooth out the weeds, resulting in the greatest loss in crop output. The competition for light, water, and nutrients is minimized with optimal spacing. Weeds cause maize yield losses of more than 30%, with maize yields falling as low as 90% in unweeded control plots. Weed loss is mostly determined by the weed flora's composition, the length of crop weed competition, and the severity of that competition. Maize yields are significantly reduced due to weed competition throughout the season (Dalley*et al*., 2006). Herbicides can be used to suppress weeds and boost yields. As a result, combining various plant populations with a pre-emergence herbicide would be a superior alternative for maize development and productivity. As a result, the purpose of this study was to see how spacing and weed management affected sweet corn growth and yield.

Materials and Methods

The field trial took place at Annamalai University's experimental farm in Annamalai Nagar from July to October of 2020. The experimental field was located at an altitude of 5.79 metres above mean sea level, between 11^0 24 N latitude and 79^0 41 E longitude. The soil in the experiment field was clayey loam in texture (47.5 percent sand, 15.6 percent silt, and 36.5 percent clay), medium in fertility (256.5 kg available N, 16.7 kg available P_2O_5 and 311.5 kg available K_2O ha^{-1}) and medium in fertility (256.5 kg available N, 16.7 kg available $P_2O_5$and 311.5 kg available K_2O). On July 18, 2013, 7.5 kg seed ha-1 of maize (sweet corn F1 hybrid – sugar 75) was seeded. The recommended dose of nutrients (120 kg N, 60 kg P_2O_5 and 40 kg K_2O ha^{-1}) were uniformly applied to all the treatments. The experiment was laid out in a split plot design with treatment comprising four spacing (45x 15 cm, 45x30 cm, 60x15cm and 60x30 cm) in main plots and six weed control treatments (Pendimethalin @ 1 kg ha $^{-1}$, Pendimethalin @ 1 kg ha $^{-1}$ +HW @ 20 DAS, Atrazine @ 1 kg ha $^{-1}$, Atrazine @ 1 kg ha $^{-1}$+ HW @ 20 DAS , hand weeding twice @ 20 and 40 DAS and unweeded control) in sub plot and it was replicated thrice.Pendimethalin and Atrazine were applied as pre-emergence treatments on the third day after planting, using a knapsack sprayer with a flood jet nozzle and 500 L of water per hectare. Weed population data was collected 20 and 40 days after seeding. At various phases of the crop, the growth and yield metrics of maize were monitored and recorded.

Result and Discussion

Effect on Weeds

The major weeds observed in the experimental plots were: *Cyperusrotantus* L., *Dacteloctenium aegyptium.,Echinochloacolonum, Cynodondactylon., Trianthema portulacastrum., Vernoniacinerea.,Cleome viscose* and *Eclipta alba.* A spacing of 45x15 cm was used to record the minimum weed population and dry biomass. The lower weed population and dry biomass is due to reducing row spacing, which increases light interception by the crop, especially early in the growing season, resulting in faster crop growth and canopy closure. Two hand weeding on 20 and 40 DAS had the lowest weed density, weed dry weight, and weed control index of the weed control methods.This is because the first hand weeding at 20 DAS efficiently eradicated all emergent weeds, while the second hand weeding at 40 DAS effectively removed weeds that sprout later, keeping weed density and dry weight below the crucial level of competitiveness. Sandhya Rani *et al*., (2011) reported a similar report. It was shown that there was a strong interaction effect between spacing and weed management strategies. With weed spacing of 45x15 cm and hand weeding twice at 20 and 40 DAS, the minimal weed count and weed dry matter output were recorded. It was sprayed with Atrazin @ 1 kg ha^{-1} and hand weeded at 20 DAS in pairs with 45x15 cm spacing.Herbicide treatment resulted in higher weed density than manual weeding twice, owing to the herbicide's ability to inhibit weed growth for up to 30 days before its efficacy began to wane, resulting in higher weed dry weight (Chandel*et al* .,1995). Table 1 summarises the information gathered on weed parameters.

Effect on Growth Parameters

Spacing has a significant effect on growth characteristics. The maximum plant height, LAI, and dry matter production on all crop growth phases were recorded on the 60x30 cm spacing among the major plot treatments (Table 2). At the flowering stage, optimal spacing allowed for higher photosystem accumulation and the maximum LAI. The robust process of proper resource utilisation in a higher crop output is reflected in growth metrics such as plant height, dry matter production, and leaf area development. As previously shown by Nadeem*et al*., plots with better weed control efficiency receive more resources and generate taller plants (2010).In hand weeding on 20 and 40 DAS, the highest growth features were seen. On 20 and 40 DAS, hand weeding produced higher plant dry matter output. This is due to hand weeding's ability to promote higher nutrient uptake and a better source-sink connection. The low plant population may be caused by increased plant height, which leads to increased photosynthetic production. Higher light interception and lesser interplant competition may be the underlying causes of increased plant growth. At all phases of crop growth, the unweeded control showed a significant decrease in plant height.Due to the complementary effect of the wider spacing as well as increasing the dry matter production and leaf area index in two hand weeding, the interaction effect between spacing and weed management was highly significant with spacing of 60x30 cm and hand weeding on 20 and 40 DAS having the best interaction effect. It's possible that this is because hand weeding gave crop plants superior weed control and allowed them to make the most of their soil resources.

Effect on Yield Attributes and Grain Yield

Under the spacing of 60x30 cm, yield components such cob length, cob girth, number of grains per cob, and individual cob weight rose. Row spacing has a significant influence on yield parameters. Low row spacing produced the smallest cob length and girth. This is because the crop's supply of nutrients and photosynthesis may be reduced as the plant height rises due to the narrow row spacing. With hand weeding on 20 and 40 DAS, higher grain and stover yields were observed. Less weed competition during the crop growth stage resulted in the largest grain production, allowing the crop to use all of the nutrients in the yield components to their maximum potential.The findings of Kamble*et al.* are consistent with these results (2005). Hand weeding twice at 20 and 40 DAS produced the longest cob length of 25.61 cm among the weed management techniques. The interaction impact on 6030 cm spacing with hand weeding twice at 20 and 40 DAS produced the greatest cob yield of 5575 kg ha^{-1} and this treatment combination was on par with 6030 cm spacing with Atrazine 1 kg ha^{-1} + hand weeding at 20 DAS produced the highest green cob yield of 5365 kg ha^{-1}. In the spacing 45x15 cm + unweeded control, the lowest green cob production was 1904 kg ha-1.Table 2 summarises the information gathered about yield parameters. The better yield was found among the interactions between spacing and weed control methods 60x30 cm with hand weeding on 20 and 40 DAS. The stover and grain yields were lowest in the unweeded control. It could be the result of aggressive weed emergence and resource competition with the crop at all stages of development. Weeds produce reduced photosynthetic efficiency and dry matter generation in unweeded plots, leading in poor crop yield.

Table.1 Effect of row spacing and weed management practices on weed density, weed dry matter production and weed index of sweet corn

Treatments	Weed density(no/m^3)		Weed dry matter production(kg/ha)		Weed control index(%)
	30 DAS	60 DAS	30 DAS	60 DAS	
A. Main plot					
M_1	8.68(75.44)	10.47(109.78)	13.03(169.35)	16.05(257.23)	59.79
M_2	8.87(78.72)	10.68(114.22)	13.43(179.89)	16.35(267.05)	55.61
M_3	8.88(78.94)	10.77(115.60)	13.87(192.04)	16.66(277.30)	52.68
M_4	8.95(80.16)	11.19(125.38)	13.88(192.05)	17.21(295.87)	54.85
SEd	0.021	0.005	0.018	0.005	-
CD (p=0.05)	0.053	0.014	0.046	0.014	-
B. Sub plot					
S_1	8.29(68.83)	10.54(111.08)	12.67(160.19)	16.29(264.89)	52.53
S_2	8.13(66.70)	10.00(99.99)	12.20(148.41)	15.23(231.56)	55.10
S_3	8.98(80.66)	10.36(107.41)	13.39(179.04)	16.12(259.36)	49.97
S_4	8.07(65.08)	9.72(94.58)	12.04(144.49)	14.57(211.96)	57.41
S_5	7.69(59.16)	9.22(84.99)	11.06(121.91)	13.40(179.31)	63.48
S_6	11.40(130.09)	14.06(197.91)	18.48(341.22)	22.35(499.04)	-
SEd	0.017	0.031	0.041	0.013	-
CD (p=0.05)	0.035	0.026	0.046	0.027	-

Main plot: M_1-45x15cm, M_2 -45x30 cm, M_3 -60x15cm and M_4 -60x30cm
Sub plot : S_1-Pendimethalin@ 1 kg ha $^{-1}$, S_2-Pendimethalin@ 1 kg ha $^{-1}$ +HW@20 DAS,S_3-Atrazine@ 1 kg ha $^{-1}$, S_4 -Atrazine @ 1 kg ha $^{-1}$+HW @20 DAS, S_5 -Hand weeding twice @20 and 40 DAS and S_6 -Unweeded control

Table.2 Effect of row spacing and weed management practices on growth and yield of sweet corn

Treatments	Plant height (cm)			Dry matter production (kg ha^{-1})		Green cob yield (kg ha^{-1})	Stover yield (t/ha)
	30 DAS	60 DAS	At harvest	30 DAS	At harvest		
A. Main plot							
M_1	59.06	101.14	120.89	5065	5682	3802	5328
M_2	80.31	108.14	123.91	5225	6705	4443	5766
M_3	82.21	110.51	126.83	5255	7004	4494	6096
M_4	84.98	113.62	129.88	5299	7287	4547	6392
SEd	0.87	1.11	1.09	11.60	111.13	24.98	166.54
CD (p=0.05)	2.19	2.40	2.95	32.48	302.30	49.98	333.08
B. Sub plot							
S_1	71.43	102.96	119.60	5161	6130	4071	5252
S_2	78.19	110.26	127.38	5228	6875	4716	6124
S_3	74.70	106.10	123.49	5194	6502	4423	5688

S_4	83.59	113.46	130.55	5260	7188	5120	6498
S_5	86.52	117.50	135.62	5296	7565	5250	6995
S_6	58.56	99.83	115.67	5128	5760	2350	4817
SEd	1.24	1.44	1.43	10.35	134.70	62.91	215.78
CD (p=0.05)	3.11	4.10	3.85	29.00	366.40	125.81	431.55

Main plot: M_1-45x15cm, M_2 -45x30 cm, M_3 -60x15cm and M_4 -60x30cm
Sub plot : S_1-Pendimethalin@ 1 kg ha $^{-1}$, S_2-Pendimethalin@ 1 kg ha $^{-1}$ +HW@20 DAS,S_3-Atrazine@ 1 kg ha $^{-1}$, S_4 -Atrazine @ 1 kg ha $^{-1}$+HW @20 DAS, S_5 -Hand weeding twice @20 and 40 DAS and S_6 - Unweeded control

Reference

1. Abuzar, M. R., Sadozai, G. U., Baloch, M. S., Baloch, A. A., Shah, I. H., Javaid, T., & Hussain, N."Effect of plant population densities on yield of maize." *The Journal of Animal & Plant Sciences* 21.4 (2011): 692-695.
2. Chandel, A. S., Saxena, S. C., and Singh, K. "Integrated weed control and its economics in soybean (Glycine max) grown in mollisols of Uttar Pradesh." *Indian Journal of Agronomy* 40.2 (1995): 228-234.
3. Dalley, C. D., Mark , B. L., & James , J. K. "Effect of weed removal timing and row spacing on soil moisture in corn (Zea-mays)." *Weed Technology* 20.2 (2006): 399-409.
4. Kamble, T.C., S.U, Kakade., S.U, Nemade., R.V, Pawar. and V.A, Apotikar. "An integrated weed management in hybrid maize." *Crop Res. Hisar* 29.3 (2005):396-400.
5. Nadeem, M.A., Awais, M., Ayub, M., Tahir, M. and Maqbool, M.M. Integrated weed management studies fot autumn planted maize. *Pakistan J.LifeSoc .Sci. 8.2* (2010.):98-101.
6. Rajendrakumar, D., Dahiya, R. Tyagi, N.T. and Kalidhonker, M.J. . Nitrogen production function of summer maize. *Crop Res*. 13.2 (1997):327-332.

Source of support: Nil; **Conflict of interest:** Nil.

Cite this article as:
Raman. R and R. Krishnamoorthy. "Response of Spacing and Weed Management on the Growth and Yield of Sweet Corn (*Zea Mays Saccharata*)."*Annals of Plant Sciences* 10.11 (2021) pp. 4345-4349.

.
DOI: http://dx.doi.org/10.21746/aps.2021.10.11.5