Original Research Article

Evaluating the Influence of Different Agronomic Strategies on the Growth and Development of Maize (*Zea mays* L.) Grown in Rice Fallows of Northern Telangana Zone

ABSTRACT:

Aims: To study the changes in plant height, dry matter production, leaf area and plant population under different tillage practices, irrigation and nitrogen levels in rice fallow maize.

Study design: Split- split plot design.

Place and Duration of Study: Regional Agricultural Research Station farm, Polasa, Jagtial during *rabi* 2022-23 and 2023-24.

Methodology: The experiment was laid out in split- split plot design with twelve treatment combinations that includes 2 main plot, 3 sub plot and 2 sub-sub plot treatments which are replicated thrice. The treatments are as follows: Main plots: T_1- Zero tillage, T_2- Conventional tillage (tillage with cultivator twice *fb* rotovator twice); Sub plots: I_1- Irrigation at 60% ASM, I_2- Irrigation at 40% ASM and I_3- Irrigation at six critical stages; and Sub-sub plot treatments: N_1- 100% RDN (240 kg ha^{-1}) and N_2- 120% RDN (288 kg ha^{-1}).

Results: Results indicated that highest mean plant height was recorded in conventional tillage (65.8, 204.4 & 210.9 cm) and in N_2 treatment (64.6, 201.3 & 207.6 cm) during sixth leaf, silking and physiological maturity respectively. Irrigations showed non-significant effect during sixth leaf and during other two stages I_3 treatment has recorded higher plant height (200.1 & 206.6 cm). Similar results were obtained in case of leaf area. The mean dry weight was also higher in conventional tillage (17915 kg ha^{-1}), I_3 treatment (16789 kg ha^{-1}) and N_2 (16418 kg ha^{-1}). The initial plant population was higher in conventional tillage (7.2 plants m^{-2}) than that of zero tillage and irrigation & nitrogen levels has no effect on population.

Conclusion: All the growth parameters were significantly affected by tillage, irrigation and nitrogen levels at all the stages except the influence of irrigation on plant height at sixth leaf stage. Plant population was significantly affected by tillage but non-significant effect was recorded by irrigation an nitrogen levels. Interaction was found between irrigation and nitrogen levels in-case of dry matter production.

Keywords: Dry matter production, Leaf area, Nitrogen, Plant height, Population, Tillage.

1. INTRODUCTION:

Global population is increasing everyday which demands for intensive farming to attain food security. But intensive farming has deteriorated the structure of soil over the years, due to which farmers are shifting towards the conservation agriculture. Conservation tillage is a practice in which at least 30% of crop residues are left in the field and is an important conservation practice to reduce soil erosion. In recent years farmer are shifting towards no-tillage systems for growing second crop in rice fallows aimed at reverting many negative effects of conventional farming practices such as soil erosion and decline in soil organic matter. Tillage operation is also concerned in many ways with the adjustment of the soil moisture content to meet the needs of the crop. Tillage operation and soil disturbance results in an increased soil aeration, residue decomposition, organic N mineralization, and the availability of N for plant use. In contrast, zero tillage can cause minimal soil disturbance and increase the buildup of surface residue, which may increase both N immobilization and N losses by leaching and denitrification (Imtiaz Ahmad *et al*., 2021).

Maize is considered as queen of cereal crops and is known for its highest yield potential among different cereals. It is a major cereal crop for livestock feed, fuel, fodder and human nutrition across the world. Globally, 1214.47 million metric tons of maize is produced and in India, 35.5 million metric tons of maize is produced from 10.4 million hectares area. Though rainy (*kharif*) season maize accounts for 83% of the total maize-growing areas in India, the productivity is very low (2,706 kg ha^{-1}) in comparison to the winter (*rabi*) maize productivity of 4,436 kg ha^{-1} (iimr.icar.gov.in/india-maize scenario). This low productivity of rainy season maize is due to the different types of stresses.

Maize is a water demanding crop and is very sensitive to different environmental stresses, particularly during tasselling and silking stage. Among all the stresses, water and nutrient stress are the most crucial and loss incurring factors. So, the adoption of appropriate irrigation scheduling practices could lead to increased yields and greater profit for farmers, significant water savings, reduced environmental impacts of irrigation and improved sustainability of irrigated agriculture (Smith *et al.,* 1996). Irrigation scheduling is an important irrigation management issues for maximizing production efficiency. It involves determining the proper amount and timing of water applications throughout the growing season. Among the three major elements (NPK), application of nitrogen fertilizer brings out huge yield increment in maize. Maize requires huge quantities of nitrogen due to its high genetic yield potential. Time-specific nitrogen applications are aimed to provide maize with nutrients when needed. Several factors including tillage intensity, crop rotation and irrigation often influenced soil N cycling (Muhammad Iqbal *et al.,* 2013).

2. MATERIALS AND METHODS:

The present experiment was conducted at was conducted at RARS farm, Polasa, Jagtial, Telangana duing *rabi* 2022-23 and 2023-24. Maize crop was grown the field in which rice is grown as a bulk crop in *kharif* season The field is geographically situated between $18^{o}49^{1}$ North latitude, $78^{o}56^{1}$ East longitude and at an altitude of 243.4 m above MSL and it falls under Northern Telangana Agro-Climatic Zone. The soil of experimental plot was sandy loamy and slightly alkaline with pH 7.42, 150.2 kg ha^{-1} of available nitrogen, 48.6 kg ha^{-1} of phosphorus and 403 kg ha^{-1} of potassium contents. To conduct the experiment ''Evaluating the influence of different agronomic strategies on the growth and development of maize grown in rice fallows" split- split plot design was used with twelve treatment combinations (2 main plot, 3 sub plot and 2 sub-sub plot) which are replicated thrice. The experimental field was laid out in 36 unit plots, each plot measuring 30 m^2 (6.0m x 5.0m). There were ten rows of maize crop in each plot and twenty-five plants in each row. The net plot consisted of eight rows with twenty-three plants per row (4.8m x 4.6m). Seeds of maize variety DHM-117 were sown @ 20 kg ha^{-1} (83333 plants ha^{-1}), with the spacing of 60 cm between the rows and 20 cm between the plants.

Treatment details of the experiment are as follows: For the tillage practices as main plot treatments, no field preparation was done for zero tillage treatment (T_1) plots and in the conventional tillage treatment (T_2) plots, field was ploughed twice with tractor drawn cultivator followed by two runs of tractor drawn rotovator. For sub plot treatments (irrigation schedules) irrigation was given after sowing for better germination and crop stand. Thereafter crop was irrigated according the treatment schedules based on different depletion levels. The treatments were I_1: Irrigation at 60% ASM, I_2: Irrigation at 40% ASM and I_3: Irrigation at 6 critical stages (sixth leaf, crop development, taselling & silking, grain filling, soft dough and hard dough stage). For sub-sub plot treatments, recommended dose of fertilizer i.e. 100 % RDN (240:80:80 kg ha^{-1} N: P_2O_5: K_2O) was applied to N_1 treatment plots and 120 % RDN (288:80:80 kg ha^{-1} N: P_2O_5: K_2O) was applied to N_2 treatment plots. Urea, SSP, MOP were used as the source of nutrients.

Timely recommended plant protection measures for maize were followed to save the crop from pests and diseases. Plant height was recorded from the five randomly tagged plants and their mean plant height was computed and expressed in centimeters at three different growth stages. Leaf area was measured with LI - 3100 leaf area meter at sixth leaf stage, silking, dough stage and physiological maturity stage and is expressed in cm^{-2}. The total number of plants m^{-2} were counted at 15 DAS and at harvest, in the experimental plot using a quadrate of one square meter, Data obtained from various parameters under study were analyzed by the method of analysis of variance (ANOVA) as described by Gomez and Gomez (1984). The level of significance used in the "F" test was given at 5 per cent.

3. RESULTS AND DISCUSSION:

3.1 Plant height (cm)

Plant height of rice fallow maize was differentially influenced at various stages by different agronomic practices (Table 1). Influence of tillage practices on plant height was significant at sixth leaf, silking and physiological maturity stages of the crop. Conventional tillage practice has recorded significantly higher plant height compared to zero tillage practice at all the stages. At sixth leaf stage, conventional tillage has recorded a higher plant height (64.6 and 67.0 cm) compared to zero tillage practice (57.9 and 60.0 cm) during 2022-23 and 2023-24 respectively. At silking stage conventional tillage has recorded a height of 202.9 & 205.9 cm and zero tillage of 189.1 & 191.5 cm. At physiological maturity conventional tillage has recorded a height of 209.6 & 212.3 cm and zero tillage 194.8 & 197.4 cm during 2022-23 and 2023-24 respectively. Conventional tillage has resulted in significantly higher plant height which is due to ploughing and harrowing of soil before sowing, resulting in favourable soil environment *viz.,* good soil aeration and loose friable soil tilth which helped in better growth of the plant by improving root penetration and nutrient uptake (Sukanta *et al.*, 2017). These findings are in line with the results reported by Vetch and Randall (2002).

Influence of irrigation schedules on plant height has shown a non-significant effect during the sixth leaf stage and significant effects at silking and physiological maturity stages of the crop. Plant height was recorded higher in I_3 treatment where irrigation was scheduled at six critical stages, the lowest height was recorded in I_2 (40 % ASM). The highest values of plant height at silking stage was in I_3 treatment (198.6 & 201.6 cm) and lowest was in I_2 (192.8 &195.8 cm). At physiological maturity highest height was recorded in I_3 treatment (205.2 & 208.0 cm) and lowest was in I_2 (198.7 & 201.3 cm) during 2022-23 and 2023-24 respectively. The increased plant height in I_3 treatment is due to optimal moisture in the root zone and also due to more availability of soil moisture to the crop during the critical stages, when the crop should be grown in a stress-free environment, which resulted in greater cell elongation through more uptake of nutrients and their assimilation. These beneficial effects are diminished as moisture stress is intensified due to prolonged irrigation intervals. These findings were in close conformity with Roy Chowdhury *et al.* (2002).

Influence of nitrogen dosages on plant height was significant at sixth leaf, silking and physiological maturity stages of the crop. N_2 (120% RDN) has recorded significantly higher plant height compared to N_1 (100% RDN) at all the stages. At sixth leaf stage, N_2 has recorded a higher plant height (63.4 and 65.7 cm) compared to N_1 (59.2 and 61.3 cm) during 2022-23 and 2023-24 respectively. At silking stage N_2 has recorded a height of 199.9 & 202.7 cm and N_1 of 192.0 & 194.8 cm. At physiological maturity N_2 has recorded a height of 206.2 & 208.9 cm and N_1 198.2 & 200.7 cm during 2022-23 and 2023-24 respectively. Nitrogen is an important nutrient for plant growth, that plays a key role in the synthesis of proteins and enzymes necessary for cell division and elongation. Therefore, increased nitrogen availability stimulates overall vegetative growth, resulting in taller plants. It is in agreement with Boomsma *et al.* (2010) who reported shorter plants with low N application rate. Similar findings were reported by Penuelas *et al*. (1994) and Rui *et al*. (2009). The interaction effects of tillage practices, irrigation schedules and nitrogen levels were found to be non-significant regarding plant height of maize at all stages (sixth leaf, silking and physiological maturity) during both years of the experimentation (*rabi* 2022-23 and 2023-24).

Table 1. Plant height (cm) at different stages as influenced by different agronomic practices in rice fallow maize

Treatment	Sixth leaf stage			Silking stage			Physiological Maturity		
	2022	2023	Mean	2022	2023	Mean	2022	2023	Mean
Tillage practices									
T_1: Zero tillage	57.9	60.0	58.9	189.1	191.5	190.3	194.8	197.4	196.1
$T_{2:}$: Conventional tillage	64.6	67.0	65.8	202.9	205.9	204.4	209.6	212.3	210.9
SEm±	1.0	0.4	-	0.5	0.7	-	0.6	0.6	-
CD (P=0.05)	5.9	2.2	-	3.2	4.5	-	3.6	3.4	-
Irrigation schedules									
I_1: 60 % ASM	62.3	64.4	63.4	196.0	198.9	197.5	202.7	205.2	203.9
I_2: 40 % ASM	60.9	63.3	62.1	192.8	195.8	194.3	198.7	201.3	200.0

I_3: At critical stages	60.6	62.8	61.7	198.6	201.6	200.1	205.2	208.0	206.6
SEm±	0.5	0.8	-	0.9	0.9	-	1.1	0.9	-
CD (P=0.05)	NS	NS	-	3.1	2.9	-	3.5	2.9	-
Nitrogen levels									
N_1: 100% RDN	59.2	61.3	60.3	192.0	194.8	193.4	198.2	200.7	199.5
N_2: 120% RDN	63.4	65.7	64.6	199.9	202.7	201.3	206.2	208.9	207.6
SEm±	0.4	0.6	-	0.8	0.7	-	0.8	0.7	-
CD (P=0.05)	1.2	1.9	-	2.4	2.2	-	2.4	2.0	-
All 2 - way and 3 - way interactions are Non-significant									

3.2 Leaf area (cm^2)

Leaf area of rice fallow maize was differentially influenced at various stages by different agronomic practices (Table 2). Influence of tillage practices on Leaf area was significant at sixth leaf, silking, dough and physiological maturity stages of the crop. Conventional tillage practice has recorded significantly higher leaf area compared to zero tillage practice at all the stages. At sixth leaf stage, conventional tillage has recorded a higher leaf area (1605 and 1715 cm^2) compared to zero tillage practice (1237 and 1312 cm^2) during 2022-23 and 2023-24 respectively. At silking stage conventional tillage has shown a leaf area of 4910 & 5108 cm^2 and zero tillage of 3237 & 3582 cm^2. At dough stage conventional tillage has recorded a leaf area of 4216 & 4400 cm^2 and zero tillage 3046 & 3256 cm^2. At physiological maturity conventional tillage has recorded a leaf area of 3815 & 3913 cm^2 and zero tillage of 2958 & 3138 cm^2 during 2022-23 and 2023-24 respectively. The enhanced root system in conventional tillage supports greater shoot growth and improved leaf expansion resulting in higher leaf area (Nedunchezhiyan *et al.*, 2011). These results finds support from the findings of Stesi *et al*. (2020).

Influence of irrigation schedules on leaf area has shown a non-significant effect during the sixth leaf stage and significant effects at silking, dough and physiological maturity stages of the crop. Leaf area was recorded higher in I_3 treatment where irrigation was scheduled at six critical stages, followed by I_1 (60 % ASM) and the lowest leaf area was recorded in I_2 (40 % ASM). The highest values of leaf area at silking stage was in I_3 treatment (4398 & 4645 cm^2) and lowest was in I_2 (3751 & 4042 cm^2). At dough stage highest values of dry matter is in I_3 treatment (3867& 4070 cm^2) and lowest was in I_2 (3357 & 3560 cm^2). At physiological maturity the highest leaf area was in I_3 (3557 & 3684 cm^2) and the lowest was recorded in I_2 (3194 & 3350 cm^2) during 2022-23 and 2023-24 respectively. Higher leaf area values in I_3 treatment are the result of availability of adequate moisture during the critical stages. Similar findings were reported by Bharati *et al*. (2007).

Influence of nitrogen dosages on leaf area was significant at sixth leaf, silking, dough and physiological maturity stages of the crop. N_2 (120% RDN) has recorded significantly higher leaf area compared to N_1 (100% RDN) at all the stages. At sixth leaf stage, N_2 has recorded a higher leaf area (1530 and 1632 cm^2) compared to N_1 (1311 and 1395 cm^2) during 2022-23 and 2023-24 respectively. At silking stage N_2 has recorded leaf area of 4547 & 4770 cm^2 and N_1 of 3599 & 3920 cm^2. At dough stage N_2 has recorded a leaf area of 3957 & 4146 cm^2 and N_1 3304 & 3510 cm^2. At physiological maturity N_2 has recorded a leaf area of 3470 & 3610 cm^2 and N_1 of 3303 & 3441 cm^2 during 2022-23 and 2023-24 respectively. With application of higher nitrogen doses, it enhances cell division and cell elongation, promoting the development of larger and more numerous leaves. These results corroborate with findings of Abd El-Hafeez *et al.* (2013) and Ramesh Babu *et al.* (2014) who reported increase in leaf area with higher nitrogen doses in maize and castor crops respectively. The interaction effects of tillage practices, irrigation schedules and nitrogen levels were found to be non-significant regarding leaf area of maize at all stages (sixth leaf, silking, dough and physiological maturity) during both years of the experimentation (*rabi* 2022-23 and 2023-24).

Table 2a. Leaf area (cm^2) at sixth leaf and silking stages as influenced by different agronomic practices in rice fallow maize

Treatment	Sixth leaf stage			Silking stage		
	2022	2023	Mean	2022	2023	Mean
Tillage practices						
T_1: Zero tillage	1237	1312	1275	3237	3582	3409
T_2:: Conventional tillage	1605	1715	1660	4910	5108	5009

SEm±	16	32	-	22	131	-
CD (P=0.05)	96	195	-	134	797	-
Irrigation schedules						
I_1: 60 % ASM	1470	1573	1522	4071	4347	4209
I_2: 40 % ASM	1406	1498	1452	3751	4042	3897
I_3: At critical stages	1387	1469	1428	4398	4645	4522
SEm±	26	65	-	69	72	-
CD (P=0.05)	NS	NS	-	225	236	-
Nitrogen levels						
N_1: 100% RDN	1311	1395	1353	3599	3920	3760
N_2: 120% RDN	1530	1632	1581	4547	4770	4658
SEm±	26	28	-	65	83	-
CD (P=0.05)	80	87	-	201	254	-
All 2 - way and 3 - way interactions are Non-significant						

Table 2b. Leaf area (cm^2) at dough stage and physiological maturity as influenced by different agronomic practices in rice fallow maize

Treatment	Dough stage			Physiological Maturity		
	2022	**2023**	**Mean**	**2022**	**2023**	**Mean**
Tillage practices						
T_1: Zero tillage	3046	3256	3151	2958	3138	3048
$T_{2:}$: Conventional tillage	4216	4400	4308	3815	3913	3864
SEm±	14	65	-	13	16	-
CD (P=0.05)	86	392	-	81	94	-
Irrigation schedules						
I_1: 60 % ASM	3668	3853	3761	3409	3543	3476
I_2: 40 % ASM	3357	3560	3459	3194	3350	3272
I_3: At critical stages	3867	4070	3969	3557	3684	3621
SEm±	40	56	-	31	35	-
CD (P=0.05)	132	183	-	102	115	-
Nitrogen levels						
N_1: 100% RDN	3304	3510	3407	3303	3441	3372
N_2: 120% RDN	3957	4146	4052	3470	3610	3540
SEm±	38	51	-	30	24	-
CD (P=0.05)	118	158	-	92	75	-
All 2 - way and 3 - way interactions are Non-significant						

3.3 Dry matter production (kg ha^{-1})

Influence of different agronomic practices on dry matter production was presented in Table 3. Influence of tillage practices on dry matter has shown a significant effect at physiological maturity stages of the crop. Conventional tillage practice has recorded significantly higher dry matter of 16745 & 19084 kg ha^{-1} and zero tillage of 12983 & 15303 kg ha^{-1} during 2022-23 and 2023-24 respectively. Ploughing and harrowing in conventional tillage creates a more favourable environment for root growth and development by loosening the soil and enhancing the soil aeration. This allows roots to penetrate deeper and access nutrients more effectively, ultimately promoting greater plant growth and higher biomass accumulation. It can also optimize the soil temperature, further promoting optimal plant growth conditions and contributing to increased dry matter production. These results are in agreement with the findings of Bimbraw (2016) and Kumar *et al*. (2006).

Influence of irrigation schedules on dry matter production has shown a significant effect at physiological maturity stage of the crop. At physiological maturity the highest dry matter production was recorded in I_3 treatment (15611 & 17966 kg ha^{-1}) where irrigation was scheduled at the critical stages and the lowest was recorded in I_2 (14020 & 16337 kg ha^{-1}) where irrigation was scheduled at 40% ASM, during 2022-23 and 2023-24 respectively. These findings were in tune with reports of Nedunchezhiyan *et al.* (2011).

Influence of nitrogen dosages was significant on dry matter production of maize. N_2 (120% RDN) has recorded significantly higher dry matter production compared to N_1 (100% RDN). At physiological maturity N_2 has recorded a dry matter of 15230 & 17605 kg ha^{-1} and N_1 of 14498 & 16782 kg ha^{-1} during 2022-23 and 2023-24 respectively. Several studies documented this effect of increased dry matter upon increase of nitrogen fertilizer (Muhammad Iqbal *et al*., 2013 and Shivay and Singh, 2000).

Among the two - way interactions, Irrigation and nitrogen levels has shown a significant interaction, during the both years of experimentation (2022-23 and 2023-24) (Table 4). The combination of I_3 treatment (irrigation at critical stages) with N_2 (120% RDN) has shown the highest dry matter production of 16804 and 19202 kg ha^{-1} during 2022-23 and 2023-24 respectively. This was found to be on par with combination of I_1 (60 % ASM) and N_2 (120% RDN) with a dry matter production of 16205 and 18583 kg ha^{-1} and the least dry matter production was recorded in I_2N_2 (13883 and 16130 kg ha^{-1}) during 2022-23 and 2023-24 respectively. All the other two- way interactions and three-way interaction was found to be non-significant during both years.

Under water stress situation (I_2) the increased dose of nitrogen (I_2N_2) has resulted in decrease of dry matter production at physiological maturity stage. This might be due to the unavailability of moisture at the root zone when requirement is high for the nutrient uptake. This has occurred because of the plentiful availability of water and nitrogen in the initial days of irrigation which resulted in rapid accumulation of biomass. But as the days progress, rapid depletion of moisture occurred due to the excess demand by the shoot, has led to wilting situation in the crop, which in turn effected the biomass accumulation. In the case of 100% RDN application under I_2 treatment the plant has less demand for the moisture even under the longer intervals of irrigation, and the crop stays healthy resulting in slow and steady accumulation of biomass over the time. Moderate supply of nitrogen increases the plant resistance to drought stress, whereas the higher or lower doses increases the sensitivity to drought stress (Song *et al*., 2019). Samuel *et al.* (2006) has reported the reduction of shoot biomass from 8.6 tons to 8.5 tons with the 50 % increase of nitrogen dose under drought stress.

3.4 Plant population

Initial and final population of rice fallow maize was differentially influenced by different agronomic practices (Table 3). Influence of tillage practices on initial plant population was significant during both 2022-23 and 2023-24. Conventional tillage practice has recorded significantly higher number of m^{-2} (6.7 & 7.7) compared to zero tillage practice (6.5 & 7.5) during 2022-23 and 2023-24 respectively. This is due to good soil aeration and fine tilth in conventional tillage, which favoured the effective germination of most of the seeds, compared to zero tillage which hinders the germination due to compaction of soil layer. The influence of tillage practices on the final plant population was found to be non-significant during both years (2022-23 and 2023-24). Influence of irrigation schedules and nitrogen doses on the initial and final plant population has shown a non-significant effect during both 2022-23 and 2023-24 years.

Table 3. Influence of different agronomic practices on the initial & final population m^{-2} and dry matter production at harvest (kg ha^{-1}) of rice fallow maize

Treatment	Initial population			Final population			Dry matter at harvest		
	2022	2023	Mean	2022	2023	Mean	2022	2023	Mean
Tillage practices									
T_1: Zero tillage	6.5	7.5	7.0	6.1	7.2	6.7	12983	15303	14143
T_2: Conventional tillage	6.7	7.7	7.2	6.2	7.2	6.7	16745	19084	17915
SEm±	0.04	0.08	-	0.05	0.06	-	59	76	-
CD (P=0.05)	0.26	0.47	-	NS	NS	-	356	459	-

Irrigation schedules									
I_1: 60 % ASM	6.7	7.5	7.1	6.2	7.2	6.7	14962	17278	16120
I_2: 40 % ASM	6.6	7.6	7.1	6.1	7.1	6.6	14020	16337	15179
I_3: At critical stages	6.7	7.6	7.2	6.3	7.2	6.8	15611	17966	16789
SEm±	0.11	0.08	-	0.09	0.13	-	138	172	-
CD (P=0.05)	NS	NS	-	NS	NS	-	449	560	-
Nitrogen levels									
N_1: 100% RDN	6.6	7.5	7.0	6.1	7.1	6.6	14498	16782	15640
N_2: 120% RDN	6.7	7.6	7.2	6.2	7.2	6.7	15230	17605	16418
SEm±	0.10	0.11	-	0.09	0.06	-	131	119	-
CD (P=0.05)	NS	NS	-	NS	NS	-	403	366	-
Interaction	NS	NS	-	NS	NS	-	S	S	-

Table 4. Interaction effect of different agronomic practices on dry matter production (kg ha^{-1}) at physiological maturity in rice fallow maize

	2022			2023		
I*N	**N_1**	**N_2**	**Mean**	**N_1**	**N_2**	**Mean**
I_1	13919	16205	15062	16173	18583	17378
I_2	15157	13883	14520	17443	16130	16786
I_3	14418	16804	15611	16730	19202	17966
Mean	14498	15631		16782	17972	

	2022 SEm±	2022 CD (P=0.05)	2023 SEm±	2023 CD (P=0.05)
Factor(T)	59	356	76	459
Factor(I)	138	449	172	560
T X I	194	NS	243	NS
Factor(N)	131	403	119	366
T X N	184	NS	168	NS
I X N	226	697	205	633
T X I X N	320	NS	291	NS

I_1: 60 % ASM, I_2: 40 % ASM, I_3: At critical stages, N_1: 100% RDN, N_2: 120% RDN

CONCLUSION

Plant height, dry weight and leaf area were significantly influenced by tillage practices at all stages and highest values were recorded in conventional tillage practice at all the stages. Irrigation schedules has shown a significant effect on these parameters at silking, dough and physiological maturity. Highest plant height, dry matter and leaf area were recorded when irrigation was scheduled at six critical stages of maize. Nitrogen schedules also shown a significant effect on height, dry matter production and leaf area at all the stages. Highest values were recorded when 120% RDN was applied during both seasons (*rabi* 2022-23 and 2023-24). Plant population was significantly effected by tillage practices but irrigation scheduling and nitrogen doses shown a non-significant effect.

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1. None

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