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as source of N. Phosphorus was applied at the rate of 100 kg ha^{-1} before sowing. SSP was used as source of phosphorus. Weeds were removed through herbicides and hand howing. Irrigation was done through canal water as per crop water demand. Insecticide 'chloropirophide' was applied for controlling stem borer. All the other agronomic and cultural practices were done uniformly.

Statistical analysis

e data were statistically analyzed using analysis of variance technique appropriate for split plot randomized complete block design. Means were compared using LSD test at 0.05 level of probability, if the F-values are signi cant [12].

Results

Emergence m^{-2}

Data regarding emergance^{-2} are presented in Table 1. Analysis of the data revealed that nitrogen levels and plant densities had non-signi cant e ect on emergence m^{-2} of maize. Likewise, the nitrogen x plant density interaction was also non-signi cant.

Days to tasseling

Data regarding days to tasseling are reported in Table 2. Analysis of the data showed that nitrogen levels and plant densities had signi cant e ect on days to tasseling of maize. However, interaction of nitrogen x plant density was non-signi cant. Mean values of the data showed that increasing nitrogen level consistently increased days to tasseling. Plots received 210 kg N ha^{-1} took higher numbers of days to tasseling (71) wh6n24(nit7 120.8307lant density was non-307lant densitns to ly)0. -1ling (71ly

N-levels (kg ha^{-1})	Plant density (plants ha^{-1})			Mean
	65000	80000	95000	
0	176	186	183	182c
120	189	193	198	193b
150	199	195	201	198a
180	200	200	203	201a
210	200	202	204	202a
Mean	193b	195ab	198a	

$LSD_{(0.05)}$ for Nitrogen=3.337; $LSD_{(0.05)}$ for Plant density=2.585.
Means of the same category followed by different letters are signi f cantly different at 0.05 level of probability using LSD test.

Table 5: Plant height (cm) of maize as affected by nitrogen and plant population.

N-levels (kg ha	)			Mean
	65000			

for Plant density=0.29.

Means of m x l Msame category followed by different letters are signi f cantly different at 0.05 level of probability using LSD test.

of maize affected by nitrogen and plant

Table 6: Number of leaves plant

signi cant. Mean values of the data showed constant increase in days to maturity with each increment in nitrogen level. Maximum days to maturity were taken by nitrogen level of 210 kg ha^{-1} followed by nitrogen level of 180 and 150 kg ha^{-1} with days to maturity of 106 and 105, respectively. Minimum days to maturity were recorded in control treatment. Maturity delayed with increasing plant density. e highest planting density of 95000 plants ha^{-1} took more days to maturity (107) while minimum days to maturity (105) were observed in planting density of 65000 plants ha^{-1}.

population.

-1

Leaf area plant^{-1}

Data on leaf area plant^{-1} are presented in Table 7. Nitrogen levels and planting densities signi cantly a ected leaf area plant^{-1}. However, interaction of nitrogen x plant density was non-signi cant. Maximum leaf area plant^{-1} (2757 cm^2) was recorded with application of nitrogen at the rate of 210 kg ha^{-1} which is statistically at par with 180 and 150 kg N ha^{-1} with leaf area of 2523 and 2544 cm^2, respectively. Likewise, leaf area decreased with increasing plant density. Higher leaf area plant^{-1} (2585 cm^2) was recorded for 65000 plants ha^{-1}. Minimum leaf area plant^{-1} (2316 cm^2) was recorded from planting density of 95000 plants ha^{-1}.

Leaf area index

Data on leaf area index (LAI) of maize are presented in Table 8. Nitrogen levels and planting densities had signi cant e ects on leaf area index. However, interaction of nitrogen x plant density was non-signi cant. Mean values of data revealed that application of nitrogen at the rate of 210 kg ha^{-1} produced maximum leaf area index (2.76) which is statistically at par with 180 and 150 kg N ha^{-1} with the LAI of 2.52 and 2.54, respectively. Lower planting density (65000 plants ha^{-1}) produced maximum LAI (2.59) and minimum LAI (2.32) was recorded from higher plant density 95000 plants ha^{-1}.

Ear length (cm)

Data on ear length of maize are shown in Table 9. Statistical analysis of the data showed that nitrogen levels and planting densities had signi cant e ects on ear length of maize. However, interaction of nitrogen x plant density was non-signi cant. Higher ear length (18.20 cm) was recorded from 180 kg N ha^{-1} which is statistically at par with 210 and 150 kg N ha^{-1} with the ear length of 17.28 cm and 17.09 cm, respectively. In case of planting densities, maximum ear length (17.71 cm) was recorded from lower plant density (65000 plants ha^{-1}) which is at par with higher plant density of 95000 plants ha^{-1}. Minimum ear length (16.84 cm) was recorded from 80000 plants ha^{-1}.

Ear weight (g)

Data regarding ear weight of maize as a ected by nitrogen and plant densities are showed in Table 10. Analysis of the data showed signi cant e ect of nitrogen levels and planting densities on ear weight. However, interaction of nitrogen x plant density was non-signi cant. Mean values of the data revealed that higher ear weight (150 g) was recorded from the treatment of nitrogen at the rate of 210 kg ha^{-1} which is statistically at par with 180 and 150 kg N ha^{-1} with the ear weight of 148 and 138 g, respectively. Similarly, maximum ear weight (145 g) was recorded from lower plant density which is statistically at par with

80000 plants ha^{-1} with the ear weight of 136 g. Minimum ear weight (133 g) was recorded from higher plant density (95000 plants ha^{-1}).

Number of plants at harvest ha^{-1}

e e ect of nitrogen and plant population on plant at harvest ha^{-}1

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N-levels (kg ha^{-1})	Plant density (plants ha^{-1})			Mean
	65000	80000	95000	
0	5246	6070	6338	5884c
120	5370	6981	7200	6517ab
150	6949	7045	7572	7189a
180	6724	7154	7394	7091 b
210	7319	8392	7879	7863 ab
Mean	6321 b	7128 a	7276 a	

$LSD_{(0.05)}$ for Nitrogen=646.20; $LSD_{(0.05)}$ for Plant density=500.54.

density of 95000 plants ha^{-1} which is statistically at par with highest planting density of 80000 plants ha^{-1} with biological yield of 7128 kg ha^{-1}. Minimum biological yield of 6321 kg ha^{-1} was recorded for 65000 plants ha^{-1}.

Grain yield (kg ha^{-1})

Data on grain yield of maize as influenced by nitrogen levels and planting density are reported in Table 15. Nitrogen levels and planting density had significant effects on grain yield of maize. Interaction of nitrogen and planting densities was non-significant. Mean values of the data revealed that application of nitrogen at the rate of 210 kg ha^{-1} produced maximum grain yield of 2673 kg ha^{-1} which is statistically at par with 180 and 150 kg N ha^{-1} with grain yield of 2475 and 2461 kg ha^{-1}, respectively. Minimum grain yield of 1803 kg ha^{-1} was recorded in control plots. The plant density of 80000 plants ha^{-1} produced maximum grain yield of 2551 kg ha^{-1} while minimum grain yield of 2143 kg ha^{-1} was recorded from 95000 plants ha^{-1}.

Harvest index (%)

Data on harvest index of maize are presented in Table 16. Statistical analysis of the data showed that planting density had significant effects on harvest index of maize. Maximum harvest index (35.95%) was recorded from planting density of 80000 plants ha^{-1} which is at par with planting density of 65000 plants ha^{-1} with harvest index of 34.52%. Minimum harvest index (29.54%) was recorded from 95000 plants ha^{-1}.

Discussion

Influence of nitrogen levels and planting density was found non-significant for emergence^{-2} of maize. These results are in line with Le Gouis who reported that nitrogen had little or no effect on emergence m^{-2} [13]. Nitrogen and planting densities significantly affected days to tasseling of maize. Plots received 210 kg N ha^{-1} took higher numbers of days to tasseling in comparison to control plots. These results are in line with Amanullah et al. who stated that delay in days to tasseling was observed with increase in N rate and number of N splits [14]. The data further revealed that higher plant density of 95000 plants ha^{-1} took more numbers of days to tasseling as compared to lower plant density of 65000 plants kg ha^{-1}. Our results agreed with Shafi et al. who reported that higher plant population took more numbers of days to tasseling compared to optimum and lower plant population [15]. Influence of nitrogen levels and planting density significantly affected days to silking of maize. Maximum number of days to silking was recorded from the treatment of nitrogen at 210 kg ha^{-1} in comparison to control treatment. These results are consistent with the finding of Amanullah et al. who stated that increasing N application delay silking in maize [14]. In case of planting densities, higher plant density of 95000 plants ha^{-1} took more numbers of days to silking. Minimum numbers of days to silking was observed in lower plant density of 65000 plants kg ha^{-1}. These results are similar with Bhatt delayed silking were observed at more dense population as compare less dense population [16]. Nitrogen levels and planting densities had significant effect on days to maturity of maize. Maximum days to maturity were observed in the treatment of nitrogen at 210 kg ha^{-1} followed by treatment of nitrogen at 180 and 150 kg ha^{-1}. Shrestha observed delay maturity with increase in nitrogen rate because nitrogen delay vegetative growth and as a result delay maturity [17,18]. Minimum days to maturity were recorded in control treatment. The data further revealed that highest planting density of 95000 plant ha^{-1} took more number of days to maturity. Minimum days to maturity were observed in planting density of 65000 plants ha^{-1}. Our results are in line with Bhatt who stated that optimum plant population completes their life cycle earlier due to the enough water and nutrients availability [16].

Influence nitrogen levels and plant densities had significant effect on plant height of maize. Maximum plant height was recorded with the application of nitrogen at the rate of 210 kg ha^{-1}. Minimum plant height was recorded from control plots. These results agreed with Wajid et al. who investigated that higher nitrogen level influence plant height [18]. In case of planting density maximum plant height was recorded from 95000 plants ha^{-1} while minimum plant height was recorded from 65000 plants ha^{-1}. Our results are supported by Malaviarachchi et al. who reported higher plant height with increase in plant population [19]. The planting density had significant effect on number of leaves plant^{-1}. Maximum number of leaves plant^{-1} was recorded from planting density of 80000 plants ha^{-1}. Minimum number of leaves plant^{-1} was recorded from planting density of 65000 plants ha^{-1}. These results are in agreement with Zandi who observed highest number of leaves plant^{-1} at optimum planting density. The effect of nitrogen levels and planting densities had significant effect on leaf area index. Mean values of data revealed that application of nitrogen at the rate of 210 kg ha^{-1} produced

higher leaf area index which is statistically at par with 180 and 150 kg N ha^{-1} with the LAI of 2.52 and 2.54, respectively [20]. ese results are similar with Jasemi et al. who reported that higher LAI associated with nitrogen treated plants have been probably due to increased leaf production and leaf area duration [21]. In case of plant density the lower planting density (65000 plants ha^{-1}) produced higher LAI. Lower LAI was recorded from higher plant density (95000 plants ha^{-1}).

ese results are similar with the nding of Maddoni et al. who stated that lower plant population got more nutrients and water compared to higher population and in turn increased growth and LAI [22]. It can be inferred from the data showed that nitrogen levels and planting densities had signi cant e ect on ear length of maize. Max dIumear ear036ese results

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