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Assesment and effect of normal and saline irrigation on growth parameters of maize cultivar jasaura village of district Kannauj, U.P.

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Abstract
The field experiment was conducted during the year 2016 and 2017 at village Jasaura district Kannauj, Uttar Pradesh. Plant height at 75 DAS was ranged from 135 – 157.33 and 134 – 158.41 cm. Plant height at harvest was ranged from 175 – 204.62 and 173. – 206.67 cm. Plant girth was ranged from 6.01 – 7.03 and 5.97 – 7.13 cm. No. of leaves were found 15.46 – 16.42 and 15.41 – 16.17. The no. of cobs/ plant were found 1.00 – 1.04 and 1.00 – 1.04. The no. of grain rows/cobs were ranged from 13.70 – 15.50 and 13.66 – 15.50. The no. of grains/row was ranged from 23.94 – 26.71 and 22.93 – 26.65. The no. of grains/cob was ranged from 336.12 – 418.21 and 313.36 – 403.16. The cob length was ranged from 15.26 – 20.11 and 14.87 – 20.81. The cob circumference was found 13.87 – 15.88 and 13.49 – 15.90. The cob yield was found that 61.35 – 87.45 and 57.52 – 91.82. The grain yield was ranged from 43.85-70.32 q ha^{-1} and 40.50-73.92 q ha^{-1}. The stover yield was ranged from 116.65-142.87 q ha^{-1} and 114.25-143.15 q ha^{-1}. All the parameters were obtained from 2016 to 2017 year respectively.

Keywords: Maize, GDP, latitude, longitude, GPS, temperature, rainfall, tassel, protein

Introduction
India has Geographical area is 329 million hectares. In which area 50% comes under the agriculture. It contributes 17.4% to GDP and also provides employment to 48.9% of population. There are 137.76 million farmers in India, out of which 67 per cent are marginal farmers, 18 per cent are small farmers, 10 per cent are semi-medium, 4 per cent are medium and less than 1 per cent is large farmers. Thus, Indian agriculture is pre-dominant with small holders According to the ninth agriculture census (2011). Maize (*Zea mays* L) or corn is a cereal grain belonging to the family gramineae/poaceae and is known as 'Queen of Cereals' because of its several uses. In addition to staple food for human being and quality feed for animals, maize serves as a basic raw material as an ingredient to thousands of industrial products that includes starch, oil, protein, alcoholic beverages, food sweeteners, pharmaceutical, cosmetic, film, textile, gum, package and paper industries *etc.* It is used worldwide for about 3500 products of different uses as feed (61%), food (17%) and also serves as a source of basic raw material of number of industries (22%) *viz.*, starch, ethanol, oil, alcoholic beverages, food sweeteners, pharma, cosmetics *etc.* No other cereal can be used in such many ways as maize. Every part of the maize plant has economic value the grains, leaves, stalk, tassel, and cob can all be used to produce a variety of food and non-food products. In India not only production and consumption of maize have been rising consistently, the consumption pattern has also changed over the years Kumar *et al.* (2012a) [13].

Materials and Methods
Location of study area
The field experiment was conducted in Jasaura village of Jalalabad block, Kannauj district situated in the western region of Uttar Pradesh with latitude of 270 05’ North and longitude of 0790 49’ East.

Climatic condition: Data on climatic parameters viz., rainfall, maximum and minimum temperatures recorded during the year of experimentation (2016 and 2017) are presented in

Table 1 and 2 The mean average rainfall for the year 2016-17 was 418.3 mm and the maximum rainfall was received in the month of September (136.8 mm) followed by May (105.2 mm). The mean maximum temperature ranged from 42.2 (May) to 40.7 ^{o}C (June). The minimum temperature ranged from 7.5 (Jan) to 7.9 ^{o}C (December).The climatic conditions were favorable for the crop growth and development during summer 2016-17. The incidence of pests and diseases was not severe; the crop stand was good and healthy.

Survey of ground irrigation water: First of all 10 surveys were conducted within the Kannauj district of Uttar Pradesh. The 10 water samples were randomly collected with the help of Global Positioning System from surveyed area in labeled plastic bottle within the district. The collected water samples brought in laboratory for further desired chemical constituents examination.

Selection of study area: After chemical analysis of water samples the Jasaura village has found both good and saline water. The most dominant crop in summer season was maize of this village. Therefore, Jasaura village was selected for conducted experiment purpose. The experimental site was lies between latitude N 270 05' and longitude E 0790 49' within the district.

Profile of district Kannauj: The Kannauj district lies between 27 ^{o}C 07' latitude and 79 ^{0}C 92' longitudes, average height from mean sea level is 456 feet's and total geographical area is 2093 sq kms. The Kannauj district has 752 villages and surrounded by districts Kanpur-Nagar, Hardoi, Etawah, Auraiya, Mainpuri, Kanpur Dehat and Farrukhabad. River Ganga divides Kannauj & Hardoi. This district has been divided into 8 blocks.

Major crops of study area: Maize; paddy, Wheat; potato and Sunflower are agriculture crops grow in this village. 8 hours agricultural power supply in summer and 8 hours agricultural power supply in winter is available in this village. Total irrigated area in this village is 196.7 hectares.

Water sampling and method of analysis: Water samples collected in pre-sowing (NW 1 and 1 SW) and Standing crop (NW 1 and 1 SW) of maize at per irrigation (6) in the year 2016 and 2017 were respectively, water samples were collected in plastic bottle and brought in laboratory for irrigation water quality assessment. The analysis of collected water samples were done by using AR grade regents, double distilled and adopted standard method to examinations.

Map of study area

Table 1: Description of treatments combination with irrigations application.

Treatments	Irrigations pattern
T1-Normal Water (GW)	Regular
T2-Saline Water (SW)	Regular
T3-NW: SW	3 NW: 3 SW
T4-SW: NW	3SW: 3 NW
T5-NW: SW	4 NW: 2 SW
T6-SW: NW	4SW: 2 NW
T7-NW:SW	5 NW: 1 SW
T8-SW: NW	5SW: 1 NW

Table 2: Description of experimental layout

S. No.	Particulars	Descriptions
1.	Year of commencement	5 March 2016 and 5 March 2017
2.	Location	Village: Jasaura district Kannauj
3.	Recommended dose of fertilizers	150: 60:40 (N: P: K) Kg ha-1 + 20Kg ZnSO4. 7H2O + 10 tonne FYM
4.	Variety	Hybrid Maize *variety* DeKalb 9108 plus
5.	Spacing	60 x 30cm
6.	No. of irrigations-	6
7.	Design	RBD
8.	Replication:	4
9.	Plot size	2.5 x 2=5 M2
10.	Net area	160 M2

Table 3: Different method of irrigation water analysis

Parameters	Methods
Water Reaction (pH)	Digital pH meter (Jackson,1948)
Electrical Conductivity	Digital Conductivity meter at 25 ^{0}C (Wilcox, 1950)
Carbonate	Determined by (A.O.A.C, 1950)
Bicarbonate	Determined by (A.O.A.C, 1950)
Chloride	Determined by (A.O.A.C, 1950)
Boron	Determined by Yoshida and Yoshida (1954)
Sulphate	Precipitation as BaSO4 -A.O.A.C (1950)
Nitrate-Nitrogen	Devedra Alloy- A.O.A.C (1950)
Calcium+ Magnesium	Cheng and Bray (1951) and Diehl *et al*. (1950).
Calcium	Cheng and Bray (1951) and Diehl *et al*. (1950).
Magnesium	Cheng and Bray (1951) and Diehl *et al*. (1950).
Sodium	Toth *et al*. method (1948).
Potassium	Toth and Prince (1949)
SAR	Richard ed. (1954) and Eaton (1950)
Total Dissolve Solids	TDS (mg l^{-1}) = EC X 640
RSC	Richard ed. (1954) and Eaton (1950)

Result and Discussion

Plant height (cm) at 75 days: As depicted in Table 4 the highest mean range plant height was observed in treatment T_1-157.33 to 158.41 followed by T_7-156.75 to 154.87, T_5-141.83 to 141.29, T_3-141.25 to 140.83, T_4-139.46 to 138.92, T_6-138.92 to 137.92, T_8-135.00 to 134.04, T_2-134.17 to 133.46 cm, from 2016 to 2017 respectively. The minimum plant height was observed in treatment T_2 133.46 cm from 2016 to 2017. The plant heights were found reducing trends in all treatments except treatment T_1 in which treatment plant height was found increasing order from 2016 to 2017

Table 4: Plant height (cm) at 75 days after sowing of maize crop in 2016 and 2017

Treatments	Plant height (cm)	
	Mean	Mean
T_1	157.33	158.41
T_2	134.17	133.46
T_3	141.25	140.83
T_4	139.46	138.92
T_5	141.83	141.29
T_6	138.92	137.92
T_7	156.75	154.87
T_8	135.00	134.04
S. Ed (±)	0.557	1.186
C.D at 5%	1.638	3.487

Similarly trends were reported by Chen *et al.*, (2018) [6], Jia *et al.*, (2018) [9], Salachna *et al.*, (2017) [20].

Plant height (cm) at harvest: As depicted in Table 5 the highest and lowest plant height was found in treatment T_1-204.62 to 206.67 and T_8-175.00 to 173.50 from previous to final year. The plant heights were found decreasing trends in all respective treatments except treatment T_1 in which treatment plant height was found increasing trend from 2016 to 2017.

Table 5: Plant height (cm) at harvest of maize crop in 2016 and 2017

Treatments	Plant height (cm)	
	Mean	Mean
T_1	204.62	206.67
T_2	174.71	174.08
T_3	180.87	180.33
T_4	180.46	179.54
T_5	181.91	180.46
T_6	178.54	177.96
T_7	204.04	202.12
T_8	175.00	173.50
S. Ed (±)	0.547	0.907
C.D at 5%	1.608	2.666

Similarly trends were determined by Chen *et al.*, (2018) [6], Jia *et al.*, (2018) [9], Awad *et al.*, (2014) [3], Aderoju and Festus (2013) [1], Mojid (2013) [16], Jouyban (2012) [10], Mostafa *et al.*, (2012) [17].

Plant girth or diameter: As depicted in Table 6 the maximum and minimum plant girth was found in treatment T_1-7.03 to 7.13 and T_2-5.97 to 5.91 from previous to final year. The plant girths were found decreasing trends in all respective treatments except treatment T_1 in which treatment plant girth was found increasing manner from 2016 to 2017. Similar trends were observed by Salachna *et al.*, (2017) [20], Awad *et al.*, (2014) [3], Aderoju and Festus (2013) [1], Mojid (2013) [16], Jouyban (2012) [10].

Table 6: Plant girth (cm) at harvest of maize crop in 2016 and 2017

Treatments	Plant girth (cm)	
	Mean	Mean
T_1	7.03	7.13
T_2	5.97	5.91
T_3	6.24	6.18
T_4	6.15	6.06
T_5	6.32	6.21
T_6	6.18	6.09
T_7	7.05	7.02
T_8	6.01	5.97
S. Ed (±)	0.034	0.022
C.D at 5%	0.101	0.066

Number of leaves per plant: As depicted in Table 7 the maximum and minimum numbers of leaves per plant were found in treatment T_7-16.25, and T_2-15.41, T_6-15.41. The numbers of leaves per plant were found decreasing trends in all respective treatments except treatment T_1 in which treatment numbers of leaves per plant were found increased from 2016 to 2017. Similarly results were observed by Chaudhary (2017) [5], Salachna *et al.*, (2017) [20], Awad *et al.*, (2014) [3], Aderoju and Festus (2013) [1], Mojid (2013) [16], Jouyban (2012) [10], Kader (2010) [11].

Table 7: Number of leaves per plant at harvest of maize crop in 2016

Treatments	No. of leaves per plant	
	Mean	Results
T_1	16.04	16.17
T_2	15.46	15.41
T_3	16.50	16.12
T_4	15.75	15.58
T_5	16.42	16.17
T_6	15.46	15.41
T_7	16.37	16.25
T_8	16.08	15.71
S. Ed (±)	0.090	0.176
C.D at 5%	0.266	0.519

Number of cobs per plant: As depicted in Table 8 the minimum and maximum number of cobs per plant was found in treatment T_3-1.00, T_3-1.00, T_3-1.00, and except these treatments all treatments had 1.04 number of cobs per plant. The number of cobs per plant increasing, decreasing and invariability trends was observed in all respective treatments from previous year 2016 to 2017 end of experiment. Number of cobs per plant was observed by Aechra (2017) [2], Chaudhary, (2017) [5],

Table 8: Number of cobs per plant at harvest of maize crop in 2016 and 2017

Treatments	No. of cobs per plant	
	Mean	Mean
T_1	1.04	1.04
T_2	1.04	1.04
T_3	1.00	1.00
T_4	1.04	1.04
T_5	1.08	1.04
T_6	1.04	1.00
T_7	1.00	1.04
T_8	1.04	1.00
S. Ed (±)	0.035	0.034
C.D at 5%	0.000	0.000

Awad *et al.*, (2014) [3], Mojid (2013) [16], Jouyban (2012) [10], Kader (2010) [11], Tavakkoli *et al.*, (2010) [21].

Number of grain rows per cob: As depicted in Table 9 the highest and lowest number of grain rows per cob was found in treatment T_7-15.50, and T_2-13.66. The number of grain rows per cob increasing in T_1 and decreasing trends was observed in all respective treatments from previous year 2016 to final year 2017. Number of grain rows per cob was reported by Aechra (2017) [2], Chaudhary, (2017) [5], Salachna *et al.*, (2017) [20], Awad *et al.*, (2014) [3], Mojid (2013) [16], Rameeh (2012) [19].

Table 9: Number of grain rows per cob at harvest of maize crop in 2016 and 2017

Treatments	No. of grain rows per cob	
	Mean	Mean
T_1	14.86	14.93
T_2	13.70	13.66
T_3	15.50	15.14
T_4	15.14	14.90
T_5	15.28	15.26
T_6	15.21	15.16
T_7	15.54	15.50
T_8	13.92	13.92
S. Ed (±)	0.174	0.138
C.D at 5%	0.513	0.407

Number of grains per row: As depicted in Table 10 the maximum and minimum numbers of grain per row were found in treatment T_1-26.65, and T_2-22.93. The numbers of grain per row increasing in T_6 and decreasing trends was observed in all respective treatments from previous year 2016 to final year 2017. Number of grains per row was examined by Aechra (2017) [2], Chaudhary, (2017) [5], Awad *et al.*, (2014) [3], Mojid (2013) [16], Rameeh (2012) [19].

Table 10: Number of grains per row at harvest of maize crop in 2016 and 2017

Treatments	No. of grains per row	
	Mean	Mean
T_1	26.71	26.65
T_2	24.56	22.93
T_3	26.12	26.00
T_4	25.71	25.69
T_5	26.50	26.26
T_6	26.15	26.25
T_7	26.87	26.46
T_8	23.94	23.79
S. Ed (±)	0.450	0.354
C.D at 5%	1.323	1.041

Number of grains per cob: As depicted in Table 11 the maximum and minimum numbers of grains per cob were found in treatment T_7-402.22, and T_2-313.96. The numbers of grains per cob increasing in T_6-397.93 to 399.46 and decreasing trends was observed in all respective

Table 11: Number of grains per cob at harvest of maize crop in 2016 and 2017

Treatments	No. of grains per cob	
	Mean	Mean
T_1	397.83	399.06
T_2	337.94	313.36
T_3	404.83	403.16
T_4	390.15	383.08
T_5	405.21	400.65
T_6	397.93	399.46
T_7	418.21	402.22
T_8	336.12	331.87
S. Ed (±)	10.328	7.071
C.D at 5%	30.374	20.795

Treatments from previous year 2016 to final year 2017. The constancy results were not found in any treatment. Number of grains per cob was investigated by Aechra (2017) [2], Chaudhary, (2017) [5], Awad *et al.*, (2014) [3], Mojid (2013) [16], Rameeh (2012) [19], Kader (2010) [11].

Cob length: As depicted in Table 12 the highest and lowest cob length was examined in treatment T_1-20.81, and T_2-14.87. The cob length increasing in T_1-20.04 to 20.81 and decreasing trends was observed in remaining treatments whereas; stability results were not investigated in any treatments from previous year 2016 to final year 2017. Similar trends were reported by Chaudhary, (2017) [5], Awad *et al.*, (2014) [3], Mojid (2013) [16], Jouyban (2012) [10], Kader (2010) [11], Tavakkoli *et al.*, (2010) [21].

Table 12: Cob length (cm) at harvest of maize crop in 2016 and 2017

Treatments	Cob length (cm)	
	Mean	Mean
T_1	20.04	20.81
T_2	15.31	14.87
T_3	16.68	16.61
T_4	16.19	16.01
T_5	16.66	16.62
T_6	16.56	16.51
T_7	20.11	19.89
T_8	15.26	14.93
S. Ed (±)	0.170	0.165
C.D at 5%	0.501	0.484

Cob circumference: As depicted in Table 13 the highest and lowest cob circumference was found in treatment T_1-15.90, and T_2-13.49. The cob circumference increasing in T_1-15.88 to 15.90 and decreasing trends was observed in remaining treatments whereas; uniformity results were not reported in any treatments from previous year 2016 to final year 2017. Cob circumference was observed by Aechra (2017) [2], Chaudhary, (2017) [5], Awad *et al.*, (2014) [3], Mojid (2013) [16], Jouyban (2012) [10], Kader (2010) [11], Tavakkoli *et al.*, (2010) [21].

Table 13: Cob circumference (cm) without husk at harvest of maize crop in 2016 and 2017

Treatments	Cob circumference (cm)	
	Mean	Mean
T_1	15.88	15.90
T_2	13.94	13.49
T_3	15.05	14.99
T_4	14.82	14.66
T_5	15.02	14.95
T_6	14.95	14.90
T_7	16.10	15.90
T_8	13.87	13.70
S. Ed (±)	0.162	0.114
C.D at 5%	0.477	0.335

Cob yield: As depicted in Table 14 the highest and lowest cob yield was found in treatment T_1-91.82 q ha^{-1} and T_2-57.52 q ha^{-1}. The cob yield increasing in T_1-87.45 to 91.82 q ha^{-1} and decreasing trends was observed in remaining treatments from previous year 2016 to final year 2017. Cob yield was determined by Aechra (2017) [2], Chaudhary, (2017) [5], Feng *et al.*, (2017) [8], Liu *et al.*, (2016) [15], Zhang *et al.*, (2016) [23], Awad *et al.*, (2014) [3], Mojid (2013) [16], Jouyban (2012), Kader (2010), Tavakkoli *et al.*, (2010) [21].

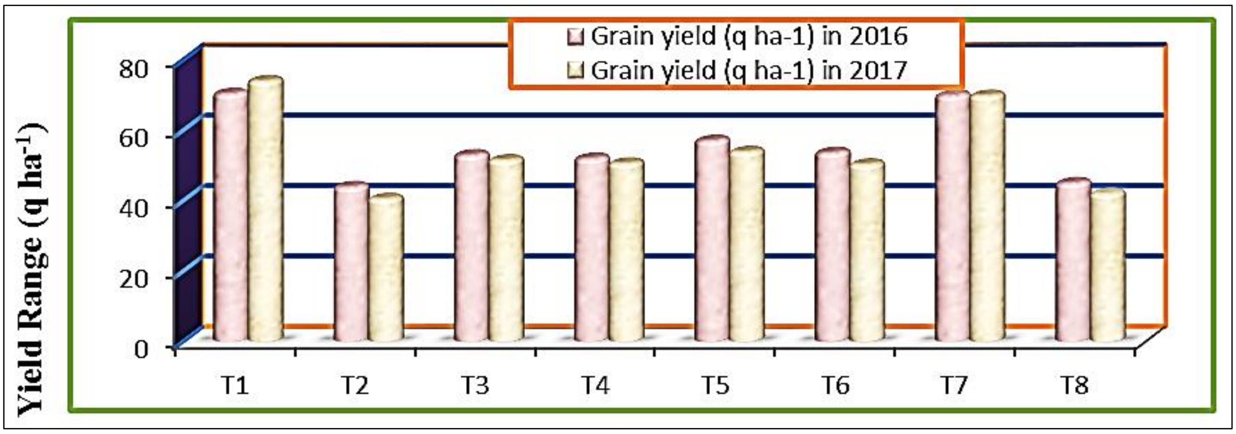
Table 14: Cob yield (q ha^{-1}) at harvest of maize crop in 2016 and 2017

Treatments	Cob yield (q ha^{-1})	
	Mean	Mean
T_1	87.45	91.82
T_2	61.35	57.52
T_3	70.67	69.15
T_4	70.07	68.87
T_5	74.50	72.65
T_6	71.52	67.87
T_7	86.95	86.80
T_8	62.45	58.65
S. Ed (±)	1.832	1.540
C.D at 5%	5.388	4.529

Grain yield: As depicted in Table 15 the maximum and minimum grain yield was found in treatment T_1-73.92 q ha^{-1} and T_2-40.50 q ha^{-1}. The grain yield increasing in T_1-87.45 to 91.82 q ha^{-1} and reducing trends were observed in remaining treatments from previous year 2016 to final year 2017. Similar trends were observed by Feng *et al.*, (2017) [8], Leogrande *et al.*, (2016) [14], Liu *et al.*, (2016) [15], Wang *et al.*, (2016) [22], Zhang *et al.* (2016) [23], Faria and Mansouri (2014) [7], Azizian and Sepaskhah (2014).

Table 15: Grain yield (q ha^{-1}) at harvest of maize crop in 2016 and 2017

Treatments	Grain yield (q ha^{-1})	
	Mean	Mean
T_1	70.32	73.92
T_2	43.85	40.50
T_3	52.87	51.45
T_4	51.90	50.52
T_5	56.97	53.82
T_6	53.55	50.25
T_7	69.80	69.77
T_8	44.97	41.95
S. Ed (±)	1.420	1.122
C.D at 5%	4.178	3.299



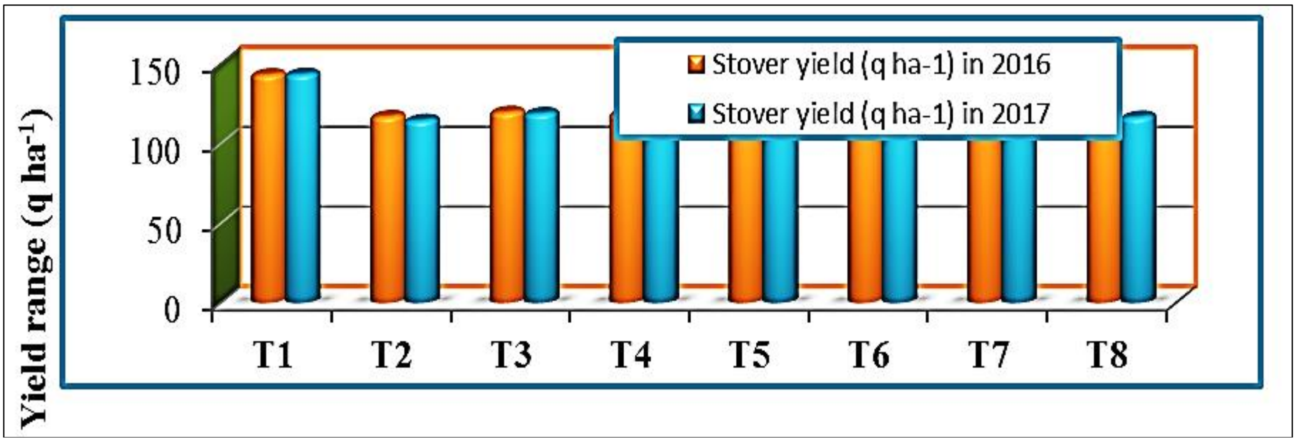
Graph 1: Grain yield (q ha^{-1}) of maize crop in 2016 and 2017

Stover yield

As depicted in Table 16 the maximum and minimum stover yield was found in treatment T_1-143.15 q ha^{-1} and T_2-114.25q ha^{-1}. The stover yield increasing in T_1-142.87 to 143.15 q ha^{-1} and reducing trends were observed in remaining treatments from previous year 2016 to final year 2017. Similar trends were reported by Aechra (2017) [2], Chaudhary, (2017) [5], Feng *et al.*, (2017) [8], Liu *et al.*, (2016) [15], Zhang *et al.*, (2016) [23], Awad *et al.*, (2014) [3], Mojid (2013) [16]

Table 16: Stover yield (q ha^{-1}) at harvest of maize crop in 2016 and 2017

Treatments	Stover yield (q ha^{-1})	
	Mean	Mean
T_1	142.87	143.15
T_2	116.65	114.25
T_3	119.35	118.57
T_4	118.17	118.05
T_5	120.47	120.42
T_6	118.00	117.72
T_7	142.42	140.50
T_8	116.57	116.30
S. Ed (±)	1.296	1.212
C.D at 5%	3.811	3.563



Graph 2: Stover yield (q ha^{-1}) of maize crop in 2016 and 2017

Conclusion

Examined in this study the plant height at 75 DAS, at post-harvest, plant girth, number of leaves per plant, number of grain rows per cob, cob length, cob circumference, cob yield, grain yield and stover yield were found reducing trends in all respective treatments except treatment T_1 in which treatment above parameters were found increasing pattern in the both years. The number of cobs per plant increasing, decreasing and invariability trends was observed in all treatments. The numbers of grain per row was found in increasing trends in T_6 and decreasing trends was reported in all respective treatments. The numbers of grain per cob was found increased in T_6 and decreasing trends was investigated in all respective treatments from 2016 to 2017 respectively.

Reference

1. Aderoju DO, Festus AG. Influence of salinity on soil chemical properties and surrounding vegetation of Awe salt mining site, Nasarawa State, Nigeria. Afr. J Environ. Sci. Technol. 2013; 7(12):1070-1075.
2. Aechra S, Yadav BL, Ghosalya BD, Bamboriya JS. Effect of soil salinity, phosphorus and biofertilizers on physical properties of soil, yield attributes and yield of cowpea [*Vigna unguiculata* (L.) Wilczek], Journal of Pharmacognosy and Phytochemistry. 2017; 6(4):1691-1695.
3. Awad MS, Solaimani GAl, Fathy S, Nakhlawy El. Effect of soil salinity at germination and early growth stages of two maize (*Zea mays* L.) cultivars in Saudi Arabia Journal of Bioscience and Agriculture Research. 2014; 1(1):47-53.
4. Azizian A, Sepaskhah AR. Maize response to different water, salinity and nitrogen levels: agronomic behavior. International Journal of Plant Production. 2014; 8(1):107-130.
5. Chaudhary O. Long-term impact of cyclic use of sodic and canal water for irrigation on soil properties and crop yields in cotton-wheat rotation in a semiarid Climate, Agric. Res. 2017; 6(3):267-272.
6. Chen W, Jin M, Ferre Ty PA, Lu Y, Xian Y *et al.* Spatial distribution of soil moisture, soil salinity, and root density beneath a cotton field under mulched drip irrigation with brackish and fresh water, Agricultural Water Management. 2018; 215:207-221.
7. Farnia A, Mansouri M. Effect of Plant density to Yield and Yield components of Maize (*Zea mays* L.) Cultivars. Bulletin of Environment, Pharmacology and Life Sciences, [Special Issue V]. 2014; 3:123-127.
8. Feng G, Zhang Z, Wan C, Lu P, Bakour A. Effects of saline water irrigation on soil salinity and yield of summer maize (*Zea mays* L.) in subsurface drainage system. Agricultural Water Management. 2017; 193:205-213.
9. Jia Q, Sun L, Ali S, Ren X. Effect of planting density and pattern on maize yield and rainwater use efficiency in the Loess Plateau in China. Agricultural Water Management. 2018; 202:19-32.
10. Jouyban Z. The Effects of salt stress on plant growth. Tech J Engin & App Sci. 2012; 2(1):7-10.
11. Kader MAL. Cytosolic calcium and pH signaling in plants under salinity stress. Plant Signal Behav. 2010; 5(3):233-238.
12. Kader MAL. Cytosolic calcium and pH signaling in plants under salinity stress. Plant Signal Behav. 2010; 5(3):233-238.
13. Kumar RS, Kumar B, Kaul J, Karjagi CG, Jat SL, Parihar CM *et al.* Maize research in India-Historical prospective and future challenges. Maize Journal. 2012a; 1(1):1-6.
14. Leogrande R, Vitti C, Lopedota O, Ventrella D, Montemurro F. Effects of irrigation volume and saline water on maize yield and soil in southern Italy. Irrigation and Drainage. 2016; 65(3):243-253.
15. Liu XW, Feike T, Chen S, Shao L, Zhang X. Effect of saline irrigation on salt accumulation and grain yield in the winter-summer maize double cropping system in low plain of North China, Journal of Integrative Agriculture. 2016; 15(12):2886-2898.
16. Mojid MA, Zahid Hossain ABMZ. Conjunctive Use of Saline and Fresh Water for Irrigating Wheat (*Triticum aestivum* L.) at Different Growth Stages, A Scientific Journal of Krishi Foundation. 2013; 11(1):15-23.
17. Mostafa AZ, Amato M, Galal YGM, Hamdi A, Lotfy SM. Effects of irrigation with saline water, and soil type on germination and seedling growth of sweet maize (*Zea Mays* L.) Arab Journal of Nuclear Sciences and Applications. 2012; 45(2):537-547.
18. NAC. According to the ninth agriculture census, 2011.
19. Rameeh V. Ion's uptake, yield and yield attributes of rapeseed exposed to salinity stress, Journal of Soil Science and Plant Nutrition. 2012; 12(4):851-861.
20. Salachna P, Piechocki R, Byckynska A. Plant growth of Curly Kale (*Brassica oleracea* L. var. *sabellica* L.) under salinity stress. J Ecol. Eng. 2017; 18(1):119-124.
21. Tavakkoli E, Rengasamy P, McDonald GK. High concentrations of Na+ and Cl- ions in soil solution have simultaneous detrimental effects on growth of faba bean under salinity stress. Journal of Experimental Botany. 2010; 61(15):4449-4459.
22. Wang Q, Huo Z, Zang L, Wang J, Zhao Y. Impact of saline water irrigation on water use efficiency and soil salt accumulation for spring maize in arid regions of China, Agricultural Water Management. 2016; 163:125-138.
23. Zhang P, Senege M, Dai Y. Effect of salinity stress on growth, yield, fruit quality and water use efficiency of tomato under hydroponics system. Reviews in Agricultural Sciences. 2016; 4:46-55.