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Enhancing Soil Fertility, Growth, Yield, and Quality of Maize as Influence under Moisture Regimes and Nutrient Management

A.Senthilkumar[1]*, B. Bhakiyathu Saliha[2], P. Saravana Pandian[3], R. Thamizh Vendan[4] and A. Gurusamy[5]

[1]Department of Soils and Environment, Agricultural College and Research Institute, Madurai-625 104, India
[2]Department of Agronomy, Agricultural College and Research Institute, Madurai-625 104, India
[3]Horticultural College and Research Institute (Women), Tiruchirapalli – 620027, India
[4]Tamil Nadu Agricultural University, Coimbatore – 641 003, India
[5]Department of Agronomy, Agricultural College and Research Institute, Madurai-625 104, India

ABSTRACT

The field experiment was conducted at Research Farm, Agricultural College, and Research Institute, Madurai district, Tamil Nadu, during Kharif and Rabi seasons 2020-2021 to study various sources and fertilizers' levels to influence deficit and excess water conditions on soil fertility, growth, yield and quality parameters like chlorophyll content, proline content of maize (Zea mays). The study revealed that excess and deficit water conditions in moisture regime irrigations at Irrigation water / Cumulative Pan Evaporation (IW/CPE) ratio of 1.0 along with nutrient management practices (N8) 125 % Soil Test Crop Response (STCR) - NPK soil application by 1 % foliar spray of micronutrient mixture. Significantly higher mean values of available nitrogen (225 kg ha-1), available phosphorous (20.81 kg ha-1), available potassium (351 kg ha-1), dry matter production (DMP) (16,404 kg ha-1), plant height (250 cm), quality parameters like chlorophyll content (55.24%), proline content (76 µg g-1) and yield (8,530 kg ha-1) and was comparable with IW/CPE ratio of 0.8, 0.6 along with others nutrient management practices at 100 % and 75 % STCR - NPK followed by foliar sprays 2 % NPK (19:19:19) and Pink-pigmented facultative methylotrophs (PPFM) 1 %. Hence, under a normal water availability situation, irrigation at an IW/CPE ratio of 0.8 was good enough to produce a higher yield, while under deficit and excess water conditions, an IW/CPE ratio of 1.0 along with a 125 % STCR-NPK by foliar spray of micronutrient mixture of 1 % was suitable for obtaining optimum nutrient management for enhancing soil fertility, yield, growth and quality parameters of maize.

Keywords: *Maize, Excess and deficit water, growth, quality, nutrient management, NPK (19:19:19), Pink-pigmented facultative methylotrophs, micronutrient mixture, yield*

INTRODUCTION

Maize *(Zea mays L.)* growth and yield are more sensitive to nutrient applications under deficit and excess water conditions. Fertilizers and improper water management are the two main factors that negatively affect the growth and productivity of maize in conditions of deficit and excess water. This research project aimed to know the appropriate STCR - NPK combination and its application time to improve maize growth and maximize yield in conditions of deficit and excess water. Careful use of the right combination of fertilizers to replenish the nutrient supply systems is a key factor in the system that aims to increase crop production for sustainable agriculture [4]. One of the causes of the yield gap is the reckless use of fertilizers by filling this gap in maize productivity, the latest production technology package, which provides for the use of foliar fertilizer in conditions of water stress at the right time, should be used to increase maize production as well as farmers net profits under deficit and excess water conditions. Efficient water management in deficit and excess water conditions could enhance crop productivity in the coming decades. The use of modern technologies, particularly irrigation water management and nutrient application, is essential to maximize crop production and benefits for farmers [15]. Water shortage during the vegetative stages of the development phase limits the grain yield in many maize production areas. In northern China, maize is the second-most (following wheat) important cereal crop, which is frequently subjected to delays in irrigation or water stress causing a significant yield reduction [14].

The balanced use of nitrogen (N), phosphorus (P), and potassium (K) fertilizers could play a fundamental role in increasing grain yields in cereals under deficit and excess water conditions. Among the limiting factors; the proper level and ratio of STCR - NPK is of prime importance [8]. The foliar application of NPK (19:19:19) could increase the productivity of plants many times over under deficit conditions. They also provide a considerable amount of water at the time of the deficit and excess water conditions. In addition to providing a nutrient for plant growth, the application of N could enhance the plant's drought tolerance to increase the yield in times of water deficit [14]. Deficit and excess water, conditions are the main

**Corresponding Author: A. Senthilkumar*
Email Address: senthilhorts052@gmail.com

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constraint on maize cultivation and lead to serious yield reductions of 40 % worldwide [16]. Irrigation water is becoming a critically scarce and expensive resource due to increasing industrial demand and urban consumption. Groundwater is being depleted at an alarming rate, so particular attention has been paid to strategy development to reduce irrigation water losses and enhance plant water productivity. Excess and deficit irrigation is an option where water availability limits conventional irrigation and reduces the risk of yield reduction due to terminal dry spells [17].

Pink-pigmented facultative methylobacteria (PPFM) are associated with the roots, leaves, and seeds of most land plants and use volatile C1 compounds such as methanol, which is produced by growing plants during the cell division phase and increases the concentration of CO2 in the stomata leads to an accelerated rate of photosynthesis and reduced the rate of photorespiration in C3 plants. Grain yield was reduced by 22.6 - 26.4 % due to a decrease in kernel number and weight [15], and decreased by 37 % due to a decline of 18 % in kernel weight and 10 % in kernel number underwater excess conditions [12]. Poor water availability and high temperatures result in significant stress during critical phases of maize (Zea mays L.) development [1]. These stress factors lead to management challenges with insects, diseases, and reduced nutrient availability and uptake by plants. Therefore, the present study was designed to assess the moisture regime irrigations at IW/CPE ratios of 0.6, 0.8, 1.0 and the nutrient management practices (75 %, 100 %, and 125 %) of STCR - NPK along with foliar applications of NPK (19:19:19), PPFM and micronutrient mixture combination and its improving maize of soil fertility, yield, growth and quality parameters under deficit and excess water conditions.

MATERIALS AND METHODS

A field experiment was conducted during the Kharif and Rabi seasons of 2020-2021 at the Research Farm of the Agricultural College and Research Institute, Madurai, Tamil Nadu (95o4' North latitude, 78o0' East longitude, and 147 m above MSL) in sandy clay loam soil (TypicHaplustalfs) as per the soil taxonomy, it was observed that the initial characterization of both experimental soil samples results (Table 1). The main plot comprises three moisture regimes viz., I1 - Irrigation at IW/CPE ratio of 0.6, I2 - Irrigation at IW/CPE ratio of 0.8, and I3 - Irrigation at IW/CPE ratio of 1.0. The subplot comprises ten nutrient management practices viz., N1 -Control (no foliar application), N2 -125 %; N3 -100 % and N4 - 75 % STCR - NPK along with foliar spray of 2 % N:P: K (19:19:19) N5 -125 %; N6 - 100 %; N7 - 75 % STCR - NPK along with foliar spray of 1 % PPFM, N8 -125 %; N9 -100 % N10 -75 % STCR - NPK along with foliar spray of 1 % micronutrient mixture,(N2-N10 based on STCR - NPK). The treatments were imposed in a split-plot design in three replications. Each replication consisted of 30 treatments.

Soil Test Crop Response (STCR) approach was applied in each plot to treatments wise in the form of urea, diammonium phosphate, and muriate of potash, respectively. Sowing was done on 11 August 2020 and 03 March 2021 the maize - COH (M) 6 seeds the hybrid matures in 110 days. It is resistant to turcicum leaf blight and downy mildew. Individual plot size: 20 m2, spacing was 60cm x 30cm; irrigation was given at the time of sowing followed by life irrigation on the fifth to the seventh day. The subsequent irrigations were scheduled based on the moisture regimes of the main plot as per the IW/CPE. All the plots were irrigated at a depth of 50 mm and were measured using the Parshall flume. The other practices of growing maize were properly taken for the management of experimental plots throughout the cropping season. Soil properties were analyzed at the critical stage (25 DAS), Plant height was measured on dry matter production, quality properties were analyzed at the roasting or milk stage and yield was computed at the harvest stage. The statistical analysis was carried out by AGRES software at a 5 % level of significance.

RESULTS AND DISCUSSIONS

Influence of deficit and excess water conditions on soil available nutrient status of maize

Moisture regimes and nutrient management practices significantly pooled data showed (Table 2) the available nitrogen, available phosphorous, and available potassium status.

Soil available nitrogen status

The application of moisture regimes and nutrient management practices significantly influenced the available nitrogen status of the soil. Among the moisture regimes, the IW/CPE ratio of 1.0 significantly recorded the maximum mean values, available nitrogen status (219 kg ha-^{1}) followed by an IW/CPE ratio of 0.8 (208 kg ha-^{1}) compared to IW/CPE ratio of 0.6 (206 kg ha-^{1}). Among the nutrient management practices, maximum mean values availability of nitrogen (225 kg ha-^{1}) was recorded in the nutrient management practices (N8) that received 125 % STCR - NPK by foliar spray of micronutrient mixture at 1 %; NPK (19:19:19) at 2 % (222 kg ha-^{1}) (N2); Pink-pigmented facultative methylotrophs at 1 % (218 kg ha-1) (N5) followed by 100 % and 75 % STCR - NPK compared to control (N1) (199 kg ha-1) under deficit and excess water conditions. Integration of moisture regimes and nutrient management practices significantly influenced the available nitrogen status, the maximum being with the application of IW/CPE ratio of 1.0 along with 125 % STCR - NPK by foliar spray of micronutrient mixture at 1 % under deficit and excess water conditions. Among the stages, a slight increase in available nitrogen status (225 kg ha-^{1}) was recorded in critical stage (25 DAS) soils compared to that preplanning soils (200 kg ha-^{1}). Similarly [4] found an increase in different forms of nitrogen levels, and its time of application influences leaf area, height, and biomass of maize planted at low and high densities. Nitrogen response of maize under temporary flooding [17]. [13] increase the effect of plant population, N application, and irrigation on the yield of synthetic maize.

Soil available phosphorous status

The application of moisture regimes significantly influenced the available phosphorous status of the soil compared to nutrient management practices. The maximum phosphorous status availability (19.94 kg ha-^{1}) was registered in the soils that received an IW/CPE ratio of 1.0 followed by that an IW/CPE ratio of 0.6 (19.66 kg ha-1) compared to IW/CPE ratio of 0.8 (18.90 kg ha-^{1}).

In the case of nutrient management practices, those values ranged from 20.81 in 125 % STCR - NPK by foliar spray of micronutrient mixture at 1 % to 18.80 kg ha-1 in control plots. The higher status of available phosphorous status in the moisture regimes treatments may be attributed to the better conservation of phosphorous applied through nutrient management practices and moisture regimes under deficit and excess water conditions in these treatments. The maximum availability of phosphorous status (21.88 kg ha-^{1}) was recorded in the treatment that received an IW/CPE ratio of 1.0 along with 125 % STCR - NPK by foliar spray of micronutrient mixture at 1 % and was on par with IW/CPE ratio of 0.6 under excess water conditions. In water deficit irrigation IW/CPE ratio of 0.6 along with (N8) 125 % STCR - NPK by foliar spray of micronutrient mixture at 1 % available phosphorous (19.76 kg ha-1) was recorded in an IW/CPE ratio of 0.8 along with 100 % and 75 % STCR - NPK at 2 % NPK (19:19:19) and 1 % Pink-pigmented facultative methylotrophs and was significantly higher than the control (N1) under deficit and excess water conditions. A slight increase in the soil available phosphorous status was registered in critical stage (25 DAS) soils (20.81 kg ha-^{1}) compared to that of the pre-planting soils (18.80 kg ha-^{1}).

Soil available potassium status

The application of moisture regimes and nutrient management practices significantly influenced the available potassium status of the soil under deficit and excess water conditions. Like available nitrogen and phosphorus, the highest available K content was recorded in the moisture regimes IW/CPE ratio of 1.0 significantly recorded the maximum mean values, and available potassium status (337 kg ha-1) was followed by that of IW/CPE ratio of 0.8 (333 kg ha-1) compared to IW/CPE ratio of 0.6 (327 kg ha-1). Among the nutrient management practices, maximum mean values availability of potassium (351 kg ha-1) was recorded in the nutrient management practices (N8) that received 125 % STCR - NPK by foliar spray of micronutrient mixture at 1%; NPK (19:19:19) at 2 % (348 kg ha-1) (N2); Pink-pigmented facultative methylotrophs at 1 % (345 kg ha-1) (N5) followed by 100 % and 75 % STCR - NPK compared to control (N1) (317 kg ha-1) under deficit and excess water conditions. Integration of moisture regimes and nutrient management practices significantly influenced the available potassium status, the maximum being with the application of IW/CPE ratio of 1.0 along with 125 % STCR - NPK by foliar spray of micronutrient mixture at 1 % under deficit and excess water conditions. Among the stages, a slight increase in available potassium status (337 kg ha-1) was recorded in critical stage (25 DAS) soils compared to that of preplanning soils (317 kg ha-1). [6] to foliar application of potassium under water deficit conditions improved the growth and yield of wheat. Similarly, report that [2] increase the effects of soil water content and foliar fertilization with nitrogen and phosphorus in the late season on the yield and composition of wheat.

Influence of deficit and excess water conditions on dry matter production and plant height of maize

Moisture regimes and nutrient management practices significantly influenced the crop dry matter production and plant height of maize (Table 3).

Pooled data in two years IW/CPE ratio of 1.0 along with 125 % STCR - NPK by foliar spray of 1 % micronutrient mixture recorded significantly higher dry matter production (16,404 kg ha-1) was on par with IW/CPE ratio of 0.8 over 0.6. Lower dry matter production (15,097 kg ha-1) and IW/CPE ratio of 1.0 along with 125 % STCR - NPK by foliar spray of 2 % NPK (19:19:19) recorded significantly higher plant height (250 cm) and was recorded in IW/CPE ratio of 0.8 and 0.6 along with 100 % and 75 % STCR - NPK. Reduction in dry matter accumulation under a lower moisture regime is because of reduced water availability which led to water deficit conditions for most of the crop growing period. Biomass accumulation is sensitive to water stress and the degree of reduction of biomass accumulation depended on the severity of water stress. Similar results are in line with the [9] allocation of nitrogen and dry matter for two soybean genotypes in response to water stress during reproductive growth. Another report by [7] on the response of wheat to foliar application of nutrients.

Influence of deficit and excess water conditions on chlorophyll and proline content of maize

Moisture regime

The pooled chlorophyll and proline content increased significantly when irrigation was scheduled at a 0.6 IW/CPE ratio compared with 0.8 and 1.0 during both years (Table 4). The yield increased significantly with an increase in moisture regime (1.0 IW/CPE ratio) during both the years and in pooled data. As regards quality parameters viz., chlorophyll and proline content at roasting or milk stage was numerically higher with scheduling of irrigation at 0.6 IW/CPE ratio but did not reach the level of significance during both the year of the experiment.

Nutrient management practices

All the quality was significantly increased with an increase in nutrient management levels. The application of 100 % STCR-NPK + 1% Micronutrient mixture recorded the highest chlorophyll and proline content of maize and was significantly superior to its lower levels, because of the greater availability of nutrients. The results confirm the findings of [10] and [11].

The quality parameters like chlorophyll and proline content in maize grain at the roasting or milk stage were significantly increased with increasing nutrient management practices (Table 3). The highest values of chlorophyll, proline content and yield were recorded with the application of 100 % STCR-NPK + 1% Micronutrient mixture.

Yield

Moisture regimes and nutrient management practices significantly influenced the yield of the crop pooled data in two years (Table 5). IW/CPE ratio of 1.0 and 0.8 along with 125 % STCR - NPK by foliar spray of 1 % micronutrient mixture recorded significantly higher yield (7188 and 7142 kg ha-1) and significantly lower yield was recorded in IW/CPE ratio of 0.6. The increase in yield could be attributed to greater and more consistent available soil moisture due to an increased level of irrigation that resulted in better crop growth and yield components. The lower yield in irrigation at IW/CPE of 0.6 along with 100 % and 75 % STCR - NPK at 2 % NPK (19:19:19) and 1 % Pink-pigmented facultative methylotrophs was significantly higher than the control (N1) might be attributed to the decrease in the synthesis of metabolites and reduction in absorption and translocation of nutrients from soil to plant under deficit and excess water conditions supply. According to [3] increasing the foliar application of nitrogen at different growth stages influences the phenology, growth, and yield of maize. [5] to effects of plant density and N on phenology and yield of maize. Similar findings were reported by [16] to improve the yield of winter maize as influenced by plant density and N levels. Pearson Correlations study on DMP, Plant height, Yield, and available nutrients of maize (Table 6).

Conclusion

From the present study, it can be concluded that irrigating at an IW/CPE ratio of 0.8 is ideal for obtaining a higher yield under normal conditions, and subsequent changes are expected to be observed in the rainfall pattern with climate change in India. As regards soil fertility, yield, growth, and quality parameters viz., chlorophyll content, proline content at roasting or milk stage was numerically higher with scheduling of irrigation at 1.0 IW/CPE ratio but did not reach the level of significance during both the year of the experiment. The quality parameters like chlorophyll content, proline content, and yield in maize grain at roasting or milk stage were significantly increased with increasing nutrient management practices. The highest values of soil nutrient, yield, growth, and quality parameters were recorded with the application of 100 % STCR-NPK + foliar sprays 1 % Micronutrient mixture of maize crop.

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Conflicts of Interest

The authors declare no conflict of interest.

Table 1: Physicochemical and biological properties of initial soil characters

Experiment I		Experiment II
A. Mechanical analysis	**Values**	**Values**
Coarse sand fraction (%)	21.27	21.10
Fine sand fraction (%)	16.12	16.03
Silt fraction (%)	27.18	26.67
Clay fraction (%)	34.03	33.82
Textural class	Sandy clay loam	Sandy clay loam
B. Soil Physical properties		
Bulk density (Mg m^{-3})	1.30	1.36
Particle density (Mg m^{-3})	2.59	2.62
Pore space (%)	48.50	49.80
C. Electro-chemical properties		
pH	7.42	7.38
EC (dS m^{-1})	0.28	0.32
CEC (cmol (p^+) kg^{-1})	15.30	18.60
D. Chemical properties		
Available N (kg ha^{-1})	200	218
Available P (kg ha^{-1})	18.80	16.30
Available K (kg ha^{-1})	317	322
Available S (mg kg^{-1})	8.42	8.91
Available Fe (mg kg^{-1})	14.20	15.30
Available Zn (mg kg^{-1})	1.23	1.28
Available Mn (mg kg^{-1})	5.30	6.04
Available Cu (mg kg^{-1})	2.37	2.32
Exchangeable Ca^{2+} (cmol (p+) kg^{-1}	11.30	12.40
Exchangeable Mg^{2+} (cmol (p+) kg^{-1}	7.20	7.61
Exchangeable Na^+ (cmol (p+) kg^{-1}	2.00	2.52
Exchangeable K^+ (cmol (p+) kg^{-1}	1.40	1.71
Organic Carbon (g kg^{-1})	6.23	6.51
$CaCO_3$ (%)	2.30	3.00
Total N (%)	0.03	0.04

Table 2: Influence of deficit and excess water conditions on soil available nutrient status at a critical stage (25 DAS) of maize

(Pooled data in two years)

Moisture Regimes	Nutrient management practices										
	N_1	N_2	N_3	N_4	N_5	N_6	N_7	N_8	N_9	N_{10}	Mean
	Soil available nitrogen (kg ha^{-1})										
$I_{1.0}$	204.32	234.00	220.00	210.70	227.59	215.80	207.80	237.30	223.00	212.60	**219.31**
$I_{0.8}$	198.50	216.40	210.70	200.59	213.20	208.59	199.40	217.80	210.30	205.50	**208.10**
$I_{0.6}$	196.00	215.70	205.20	200.00	214.00	201.30	198.20	220.50	210.70	201.80	**206.34**
Mean	**199.60**	**222.03**	**211.96**	**203.76**	**218.26**	**208.56**	**201.80**	**225.20**	**214.66**	**206.63**	

	Soil available phosphorus (kg ha-1)										
I 1.0	18.93	20.79	19.90	19.39	20.30	19.72	18.97	21.88	20.15	19.44	**19.94**
I 0.8	18.72	19.35	18.71	18.54	18.94	18.67	18.87	19.76	18.86	18.64	**18.90**
I 0.6	18.75	20.30	19.89	19.03	20.00	19.86	18.86	20.80	19.88	19.28	**19.66**
Mean	**18.80**	**20.14**	**19.50**	**18.99**	**19.74**	**19.41**	**18.90**	**20.81**	**19.63**	**19.12**	
	Soil available potassium (kg ha-1)										
I 1.0	319.80	355.19	344.80	324.80	350.30	330.00	320.39	353.79	345.69	325.500	**337.02**
I 0.8	317.40	347.10	337.80	319.10	348.49	327.30	317.70	348.40	348.00	320.400	**333.17**
I 0.6	314.99	344.10	324.40	318.60	337.70	320.50	315.50	351.30	331.20	318.700	**327.70**
Mean	**317.39**	**348.79**	**335.66**	**320.83**	**345.49**	**325.93**	**317.86**	**351.16**	**341.63**	**321.533**	

	Soil available nitrogen (kg ha-1)				**Soil available potassium (kg ha-1)**				**Soil available potassium (kg ha-1)**			
	I	**N**	**I at N**	**N at I**	**I**	**N**	**I at N**	**N at I**	**I**	**N**	**I at N**	**N at I**
SEd	1.31	2.42	4.196	4.196	0.14	0.22	0.391	0.399	3.72	2.39	6.45	6.57
LSD (0.05)	3.74	4.87	NS	NS	0.42	0.45	NS	NS	7.49	6.83	NS	NS

Table 3: Influence of deficit and excess water conditions on dry matter production (kg ha-1) and plant height (cm) at harvest stages of maize

(Pooled data in two years)

Moisture Regimes	**Nutrient management practices (kg ha-1)**										
	N1	**N2**	**N3**	**N4**	**N5**	**N6**	**N7**	**N8**	**N9**	**N10**	**Mean**
	Dry Matter Production (kg ha-1)										
I 1.0	16,485	16,488	16,176	16,170	16,480	16,190	16,165	16,488	16,197	16,172	**16,301**
I 0.8	15,499	16,360	15,709	15,667	16,349	15,722	15,655	16,367	15,730	15,700	**15,875**
I 0.6	13,308	16,353	14,234	14,165	15,790	14,266	13,500	16,358	14,268	14,200	**14,644**
Mean	**15,097**	**16,400**	**15,373**	**15,334**	**16,206**	**15,392**	**15,106**	**16,404**	**15,398**	**15,357**	
	Plant Height (cm)										
I 1.0	251.70	259.50	254.30	245.80	257.20	256.60	250.00	258.70	251.80	248.20	**253.38**
I 0.8	243.10	254.80	248.70	245.20	251.49	252.19	245.50	252.50	247.49	252.49	**249.34**
I 0.6	219.60	235.20	229.50	224.60	230.59	232.50	225.20	233.90	227.79	218.30	**227.72**
Mean	**238.13**	**249.83**	**244.16**	**238.53**	**246.43**	**247.10**	**240.23**	**248.36**	**242.36**	**239.66**	

	Dry Matter Production (kg ha-1)				**Plant Height (cm)**			
	I	**N**	**I at N**	**N at I**	**I**	**N**	**I at N**	**N at I**
SEd	206.90	95.86	358.36	353.23	2.67	1.89	4.64	4.79
LSD (0.05)	415.96	273.30	742.65	732.01	5.38	5.40	NS	NS

Table 4: Effect of deficit and excess water on chlorophyll content, proline content (µg g-1) at roasting or milk stage of maize

(Pooled data in two years)

Moisture Regimes	**Nutrient management practices (kg ha-1)**										
	N1	**N2**	**N3**	**N4**	**N5**	**N6**	**N7**	**N8**	**N9**	**N10**	**Mean**
	Chlorophyll content (%)										
I 1.0	54.80	57.29	55.50	54.10	55.50	55.29	53.09	59.70	53.80	53.40	**55.24**
I 0.8	50.20	55.30	53.40	52.00	53.50	53.25	50.20	54.09	54.50	53.00	**52.94**
I 0.6	44.50	49.30	48.50	46.31	49.39	48.30	47.00	49.39	49.60	47.10	**47.94**
Mean	**49.83**	**53.96**	**52.46**	**50.80**	**52.80**	**52.28**	**50.09**	**54.39**	**52.63**	**51.16**	
	Proline content (µg g-1)										
I 1.0	77.00	77.83	75.50	74.09	76.20	76.40	72.80	78.55	76.31	75.31	**76.00**
I 0.8	65.70	76.60	72.69	69.34	73.52	71.70	66.37	76.20	72.40	70.00	**71.45**
I 0.6	61.50	69.50	65.77	65.42	67.48	65.60	65.23	70.40	66.96	65.79	**66.36**
Mean	**68.06**	**74.64**	**71.32**	**69.62**	**72.40**	**71.23**	**68.13**	**75.05**	**71.89**	**70.37**	

	Chlorophyll content (%)				Proline content (µg g-1)			
	I	N	I at N	N at I	I	N	I at N	N at I
SEd	0.67	0.23	1.16	1.13	0.94	0.37	1.62	1.59
LSD (0.05)	1.35	0.66	2.38	2.31	1.89	1.07	3.35	3.27

Table 5: EEffect of deficit and excess water on yield (kg ha-1) of maize (Pooled data in two years)

Moisture Regimes	Nutrient management practices										
	N_1	N_2	N_3	N_4	N_5	N_6	N_7	N_8	N_9	N_{10}	Mean
	Yield (kg ha-1)										
$I_{1.0}$	6,537	8,690	8,179	7,640	8,541	8,037	6,765	8,541	8,790	7,856	**7,979**
$I_{0.8}$	6,477	8,464	7,945	6,684	8,198	7,713	6,628	8,198	8,462	7,618	**7,689**
$I_{0.6}$	5,445	8,311	7,357	6,081	7,937	6,311	6,043	7,937	8,312	5,628	**6,973**
Mean	**6,153**	**8,421**	**7,827**	**6,801**	**8,425**	**7,420**	**6,478**	**8,225**	**8,521**	**7,034**	

	Yield (kg ha-1)			
	I	N	I at N	N at I
SEd	94.69	37.70	164.01	160.09
LSD (0.05)	190.37	107.48	337.37	329.32

Table 6: Pearson Correlations study on DMP, Plant height, Yield, and available nutrients of maize

(Pooled data in two years)

Pearson Correlations							
		DMP	Plant Height	Yield	Aval N	Aval P	Aval K
DMP	Correlation	1					
	DMP						
Plant Height	Correlation	.842**	1				
	Plant Height	.000					
Yield	Correlation	.664**	.546**	1			
	Yield	.000	.002				
Aval N	Correlation	.679**	.607**	.933**	1		
	Aval. N	.000	.000	.000			
Aval P	Correlation	.328	.165	.805**	.816**	1	
	Aval. P	.077	.384	.000	.000		
Aval K	Correlation	.633**	.504**	.920**	.888**	.666**	1
	Aval. K	.000	.005	.000	.000	.000	

**. Correlation is significant at the 0.01 level (2-tailed).

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