

TO STUDY THE PHYSICO-CHEMICAL PROPERTIES OF MANDAWAR BLOCKS' SOILS COLLECTED FROM DIFFERENT VILLAGE, MANDAWAR BLOCKS, DAUSA, RAJASTHAN

ABSTRACT

We carried out the analysis ~~Analysed~~ at the division of ~~soil-Soil science-Science~~ and ~~agricultural-Agricultural chemistry-Chemistry~~, NAI, SHUATS. The soil texture in ~~the~~ area varied from sandy loam. ~~In general,~~ ~~the~~ top soils had ~~a~~ higher sand fraction ~~then than~~ the lower layers. The study revealed that the ~~range of~~ bulk density ~~was ranged~~ from 1.32-1.47 Mg m⁻³ ~~and the bulk density was~~ increased with increasing ~~the~~ depth as the compaction ~~increases~~ increased. The range of particle density was ~~from~~ 2.36-2.49 Mg m⁻³ and the pore space ~~was~~ 37.77-~~to~~ 44.17 %. The ~~water-water~~ retaining capacity (WRC) of soil ranged between 43.56 to 57.28. The pH of soils ranged between (~~pH~~ 6.67 ~~-and~~ 7.75). The electrical conductivity of ~~the~~ soil of ~~the~~ entire studied area ~~were was~~ less than 1 dSm⁻¹. The ~~soil~~ organic matter, ranges from 0.13 to 0.38 %. The available nitrogen content of ~~the~~ entire studied area was low (162-~~to~~ 310 kg ha⁻¹). The available phosphorus and potassium content varied ~~in~~ between 15 to 52 ~~kg ha⁻¹~~ and 125 to 255 kg ha⁻¹ ~~respectively~~. The available zinc, copper, manganese, and iron ~~of soil~~ ranged between 0.30 to 0.82 ~~mg kg⁻¹~~, 0.36 to 1.32 ~~mg kg⁻¹~~, 1.50 to 6.04 ~~mg kg⁻¹~~ and 2.36 to 9.62 mg kg⁻¹ ~~respectively~~. The fertility database would be very useful for extension functionaries, agricultural officers, scientists, and above all ~~the~~ farmers for a sustainable crop production.

Keywords: ~~Dausa district,~~ ~~pH,~~ ~~EC~~ Electrical conductivity, ~~OC~~ Organic Carbon, ~~pH,~~ ~~Soil~~ Nitrogen, ~~Potassium,~~ ~~Phosphorus~~ Element, ~~Dausa district~~.

INTRODUCTION

Soil is one of the most important natural resources of any country and it is indispensable for our universe. It nourishes the entire plant kingdom and sustenance human life. Soil is the unconsolidated mineral matter on the earth's surface that has been subjected to and influenced by parent material, climate (including rainfall and temperature), topography, and microorganisms, all acting over a ~~period of time~~ while and producing a product that is soil. (Soil Science Society of America, 1970).

The growing population of the earth demands a systematic evaluation of soil resources ~~with respect to~~ concerning their extent, distribution, characteristics, and use potential, which is very important for developing ~~an~~ effective land use planning for augmenting agricultural production on ~~a~~ sustainable basis (Pulakeshi *et al.*, 2014). Although soil provides food, fuel, fodder, and fiber the primary essential to sustain life ~~but~~ it is ~~a~~ most neglected and misused natural resource.

Physical properties analysis generally includes simple, fast, and low-cost methodologies. The physical properties of soil that were assessed were bulk density, particle density, porosity, water holding capacity, specific gravity, and soil color. The texture

describes the proportion of three sizes of the soil particles and the fineness or coarseness of a soil. Soil texture is an important factor affecting the balance between water and gases, but it is very stable ~~along~~ over time, independently ~~on~~ of the soil management. (Prince, 2008).

Chemical attributes have been correlated with plant yields and thus the variations of a particular indicator are easily interpreted, and allow a quick improvement of the soil chemical properties by liming and fertilization. Soil chemical parameters have been traditionally used for assessment of potentially available nutrients for crops, and are based on worldwide well-established analytical methodologies. The chemical properties that were analyzed were ~~sod~~ pH, electrical conductivity, organic carbon, organic matter, Available Nitrogen ~~nitrogen~~, Phosphorus ~~phosphorus~~, and Potassium ~~potassium~~ in soil. Secondary nutrients such as Sulphur ~~sulfur~~, Calcium ~~calcium~~, and Magnesium ~~magnesium~~ and heavy metals content, such as Zinc ~~zinc~~, Boron ~~boron~~, Iron ~~iron~~, Manganese ~~manganese~~, and Copper ~~copper~~. (Bennett *et al.*, 2010).

Micronutrient deficiencies were first reported at the end of the 19th century and today it is well known that the extensive areas of our soils are incapable of supplying plants with sufficient amounts of micronutrients. The application of fertilizer in the soil having only major nutrients, the loss of micronutrients ~~through~~ plant uptake and leaching, the decreasing proportion of farm yard manure and other organic manures in comparison with fertilizers, and several other factors collectively contribute towards the deficiency of micronutrients in soils. (Rattan *et al.*, 2009).

Rajasthan is located ~~at in the north~~ North-western part of India and is the biggest state in the country and ~~the~~ seventh largest by population. It has an area of 3, 42,239 sq.km encompassing 11% of the total geographical area of India. ~~As a matter of fact,~~ Rajasthan's area is similar to that of Western countries like Italy (3, 01,200 sq. km), Norway (3, 24,200 sq. km), and Poland (3, 12,600 sq. km). The state was formed on 30 March 1949 when Rajputana – the name adopted by the British Raj for its dependencies in the region was merged into the Dominion of India. Important cities are Jaipur, Dausa, Jodhpur, Kota, Bikaner, Ajmer, Alwar and Udaipur. The states of Haryana, Uttar Pradesh, and Punjab bound the state of Rajasthan in the north and northeast. Uttar Pradesh and Madhya Pradesh lie ~~on in~~ the east while the state of Gujrat is located ~~at in~~ the southwest of the state. (Akron S. G. and Paramasivan, M., 2013). ~~Thus we aimed from the current study to~~

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2. MATERIALS AND METHODS

2.1 Study Area

Dausa is located at 27°8' 41" N 76°50'28" E. The city covers an area of 64 km² and lies at an altitude of 467 m (1532 ft.) above sea level. The city lies 54 km west of the state capital, Jaipur. Dausa has a semi-arid climate. Temperatures vary in different seasons. In the summer ~~months of~~ (April to June), ~~the~~ average daily temperature ~~of around was~~ 35°C, ~~while~~

May and June are the hottest months in Dausa, and the temperature reaches up to 40-45°C in these months. Annually the rainfall is concentrated in the monsoon months between June (Last of Late June) and September, and is estimated to receive over 500 mm (approximately 20 inches) of rainfall on average. The winter months of (November to February) are mild and pleasant, with average temperatures in the of 15-18°C range and little or no humidity. December and January are the coldest months in Dausa, with a temperature varying between 5-10°C in these months. There are however occasional cold waves that lead to temperatures near freezing.

2.2 Soil Sampling

A total of twenty-seven soil samples were collected from nine different villages in three different blocks of coastal areas, Ganjam district namely Chatrapur, Rangeilunda, and Chikiti. Samples were collected from three different depths *i.e.*, 0-15 cm, 15-30 cm and 30-45 cm. Soils were collected with the help of Spade and Khurpi from Crop fields making a V-shaped method. Those samples were dried in a shaded place and large clods were broken down by using a wooden mallet and separated the larger particles of soils by using a 2 mm sieve. After that, Soils were collected in a polythene bag and were labelled properly for Laboratory analysis.

Table 1. The methods of analysis for different soil parameters

S. No.	Particulars	Scientist Name	Methods	Unit
PHYSICAL PROPERTIES				
1.	Bulk density	Black (1965)	Pycnometer	Mg m ⁻³
2.	Particle density	Black (1965)	Pycnometer	Mg m ⁻³
3.	Textural class (Sand, Silt, Clay)	Bouyoucos (1927)	Bouyoucos hydrometer	Percentage (%)
4.	Pore space	Black (1965)	-	Percentage (%)
5.	Water Holding capacity	Muthuval <i>et al.</i> (1992)	Graduated measuring cylinder	Percentage (%)
CHEMICAL PROPERTIES				
1.	Soil pH (1:2.5)	Jackson (1958)	Digital pH meter	
2.	Electrical conductivity (1:2.5)	Wilcox (1950)	Digital conductivity meter	dS m ⁻¹
3.	Organic carbon	Walkley and Black (1947)	Wet oxidation method	Percentage (%)
4.	Available nitrogen	Subbiah and Asija (1956)	Soil alkaline permanganate method	kg ha ⁻¹
5.	Available phosphorus	Olsen <i>et al.</i> (1954)	Photometric colorimeter method	kg ha ⁻¹
6.	Available potassium	Schollenberger and Simon	Flame photometric method	kg ha ⁻¹

RESULT AND DISCUSSION

Physical Properties

The textural classification of soil in different villages of Mandawar block. The texture classification of soil samples was shown as Sandy loam in all villages. The maximum bulk density recorded was 1.47 Mg m⁻³ in both V₆- Nangal Meo and V₉-pakher which indicates that the soil is composed of sand and aggregated loams. The minimum bulk density was recorded in V₁-kot which was 1.32 Mg m⁻³. Similar A similar finding was reported by Sahoo *et al.*, (2015) and Pusty and Panda (2019). Soil particle density ranges from 2.36–2.49 Mg m⁻³. V₆-Nangal meo and was reported as the highest in particle density i.e. 2.49 (Mg m⁻³) followed by V₈ - Reendli i.e. 2.49 (Mg m⁻³), and the lowest was found in V₁ - Kot i.e. 2.36 (Mg m⁻³). Similar results were reported by (Chaudhari *et al.*, 2013). Soil porosity in a soil sample ranges from 37.17–44.17%. V₆- Kot reported as the highest porosity of 44.17% followed by V₉-

Pakhar of 44.09%, while v_7 –Nangal meo reported as the lowest porosity i.e. 37.17%. Significant ($P < 0.05$) results were observed by (Ahadet *et al.*, 2015). The values of water holding capacity of soil ranges from 36.15– 42.54%. Highest water holding capacity was observed in the V_9 –Phakar, which was 42.54% whereas the lowest water holding capacity was observed in V_1 –kot, i.e. 38.68% content in the soil sample. Similar results were reported by (Das *et al.*, 2018).

Table 2: Physical Properties Bulk and particle density of the soil samples in different villages of the Mandawar block

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S. No.	Soil bulk density			Soil particle density		
	0-15 cm	15-30 cm	15-45 cm	0-15 cm	15-30 cm	15-45 cm
V_1	1.32	1.34	1.38	2.28	2.32	2.36
V_2	1.34	1.36	1.4	2.34	2.38	2.42
V_3	1.35	1.37	1.4	2.39	2.43	2.46
V_4	1.36	1.38	1.41	2.36	2.39	2.44
V_5	1.4	1.43	1.45	2.33	2.37	2.40
V_6	1.42	1.45	1.47	2.40	2.44	2.49
V_7	1.38	1.4	1.43	2.31	2.33	2.38
V_8	1.41	1.43	1.46	2.36	2.39	2.49
V_9	1.43	1.46	1.47	2.40	2.44	2.47
F- test	NS	NS	NS	NS	NS	NS
S.Em.	-	-	-	-	-	-
(±)	-	-	-	-	-	-
C. D. @ 5 %	-	-	-	-	-	-

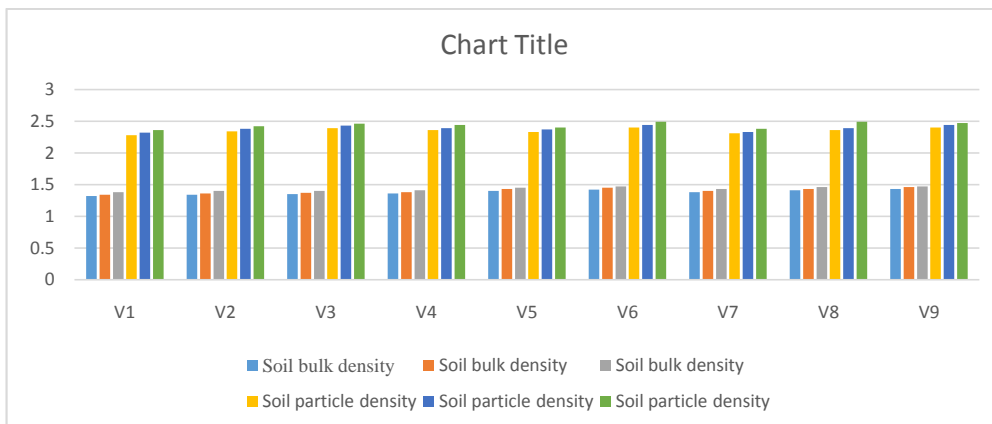


Fig. 1: Bulk density ($Mg\ m^{-3}$) & Particle density of soil samples in different villages of the Mandawar block($Mg\ m^{-3}$)

Table 3: Soil porosity and water holding capacity of soil samples in different villages of

S. No.	Soil porosity			Soil water holding capacity		
	0-15 cm	15-30 cm	15-45 cm	0-15 cm	15-30 cm	15-45 cm
V ₁	44.17	41.86	38.52	41.34	39.60	36.88
V ₂	42.35	40.55	39.77	40.55	38.54	39.19
V ₃	41.42	39.49	38.13	38.88	36.15	39.59
V ₄	43.49	41.42	40.04	39.56	38.67	39.72
V ₅	43.84	40.36	37.67	40.75	36.87	39.63
V ₆	40.52	38.23	36.29	38.65	35.58	40.26
V ₇	41.00	37.17	35.23	37.55	34.23	39.45
V ₈	43.98	41.52	39.24	41.54	38.38	39.23
V ₉	44.09	41.56	37.23	42.54	37.97	38.68
F- test	S	S	S	S	S	S
S.Em.	0.45	0.62	0.75	0.5	0.59	0.58
(±)						
C. D. @ 5 %	0.092	0.053	0.045	1.5	2.46	2.32

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[the Mandawar block](#)

[Physical Properties](#)

Table 3: Physical Properties

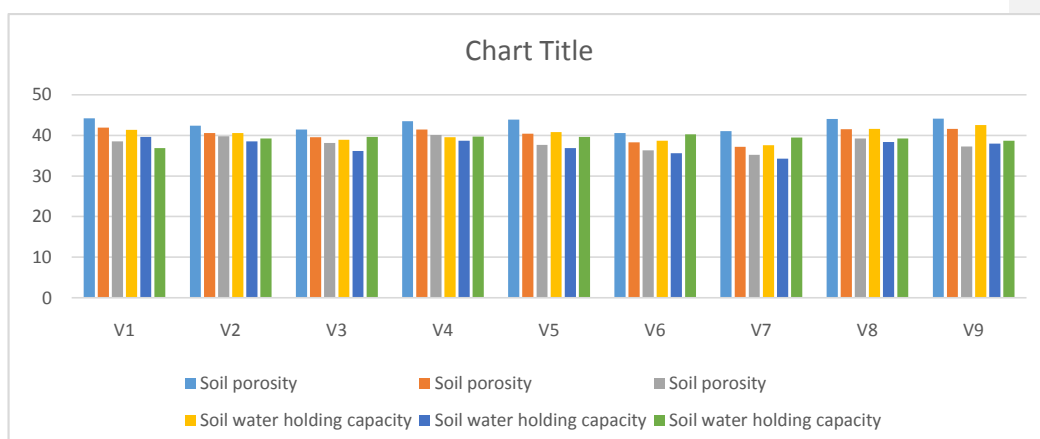


Fig. 2 soil-Soil porosity and water holding capacity of soil samples in different villages of the Mandawar block

Soil Chemical Properties

pH of a soil samples ranges from 6.67–7.75. The highest pH value was observed in the V₄-Manipura, i.e. 7.75 followed by V₆, i.e. 7.70 and the lowest pH was found in V₅ - Hadoli, i.e. 6.67. The results show the pH was in the neutral range. The pH is significant and appropriate for the nutrient availability. Similar significant results were reported by (Basavaraja et al., 2017). EC in a soil samples ranged from 0.20–0.24 dS m⁻¹. The results were found to be significant. The highest EC content was reported in V₁ - Koti, i.e. 0.65 dS m⁻¹ followed by V₂- Kolar, i.e. 0.60 dS m⁻¹ whereas the lowest EC content was observed in V₉- Phakeri, i.e. 0.20 dS m⁻¹. Similar results were reported by (Basavaraja et al., 2017). Organic carbon in soil samples value ranges from 0.13–0.38%. The results were found to be significant. Highest and the highest organic carbon was reported in V₅ - Hadoli, i.e. 0.38%, whereas the lowest organic carbon was observed in V₉- Phakeri, i.e. 0.13%. The organic carbon is low as there is less vegetation is used as residue and due to the tropical climate, degradation is quick in the whole block. Similar results were reported by (Deshmukh et al., 2012). Nitrogen content in soil samples ranges from 162–310 kg ha⁻¹. The results were found to be significant and the highest nitrogen content in soil was observed in V₇ - Munapura, i.e., 310 kg ha⁻¹, and the lowest nitrogen content was reported in V₈ - Nangal, i.e. 162 kg ha⁻¹. Similar results were observed with (Sheeba et al., 2019). Phosphorus in soil

samples ranged from 15–52 kg ha⁻¹. The results were found to be significant. The highest phosphorus was reported in V₁ – Koti.e. 30 kg ha⁻¹, whereas the lowest phosphorus content was observed in V₄ - Munapura.e.15 kg ha⁻¹. Significant results were observed (Das et al., 2018). Potassium content in the soil samples ranges from 125–255 kg ha⁻¹ the results were found to be significant. and The highest potassium content was reported in V₃- Banawar.e. 289 kg ha⁻¹, whereas the lowest potassium content was observed in V₈ – Reendli.e. 125 kg ha⁻¹. The status of potassium was found moderate in the whole region due to alluvial soil which is moderate to high in available potassium. Similar results were observed with (Sharma et al., 2014).

Table 4: Soil pH, EC, and Organic carbon of soil samples in different villages of the Mandawar block

S. No.	Soil pH			Soil EC (dS m ⁻¹)			Soil organic Carbon (%)		
	0-15 cm	15-30 cm	30-45 cm	0-15 cm	15-30 cm	30-45 cm	0-15 cm	15-30 cm	30-45 cm
V ₁	7.32	7.40	7.44	0.64	0.65	0.65	0.27	0.23	0.20
V ₂	7.35	7.48	6.56	0.60	0.58	0.55	0.30	0.27	0.33
V ₃	7.64	7.65	7.40	0.32	0.38	0.40	0.30	0.24	0.20
V ₄	7.60	7.70	7.75	0.55	0.45	0.56	0.27	0.24	0.21
V ₅	7.62	7.65	6.67	0.51	0.52	0.53	0.38	0.33	0.30
V ₆	7.70	7.65	7.17	0.46	0.40	0.43	0.23	0.20	0.18

V ₇	7.70	6.70	7.32	0.68	0.65	0.70	0.24	0.18	0.15
V ₈	7.50	7.55	7.31	0.27	0.30	0.28	0.31	0.25	0.23
V ₉	7.40	7.30	7.25	0.21	0.20	0.23	0.18	0.15	0.13
F- test	S	S	S	S	S	S	S	S	S
S.Em.	0.13	0.09	0.12	0.005	0.005	0.003	0.003	0.003	0.002
(±)									
C. D. @ 5 %	0.39	0.28	0.37	0.001	0.001	0.001	0.01	0.01	0.006

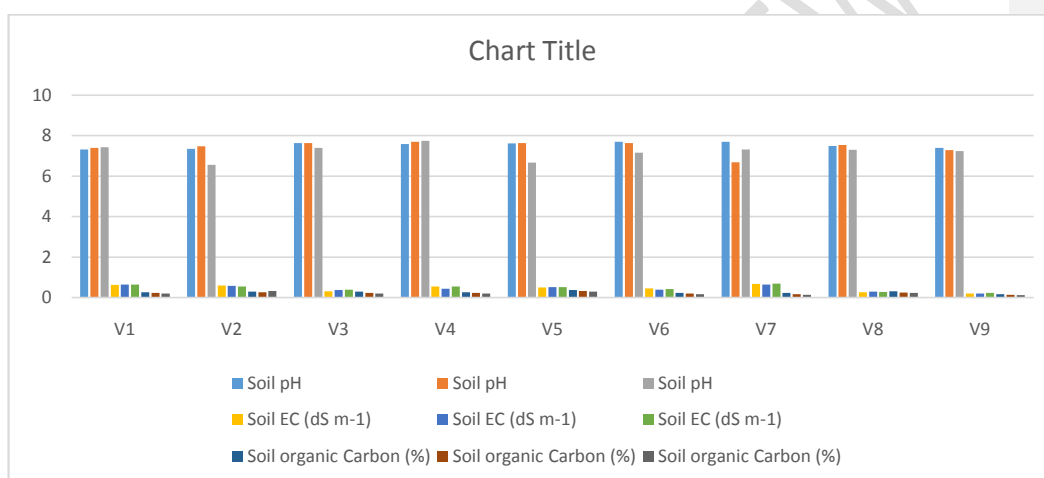


Fig. 3 Soil pH, Soil EC, and Organic carbon-carbon of soil samples in different villages of the Mandawar block.

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Table 5: Available nitrogen, phosphorus, and potassium of soil samples in different villages of the Mandawar block

S. No.	Soil Nitrogen (kg ha ⁻¹)			Soil Phosphorus (kg ha ⁻¹)			Soil Potassium (kg ha ⁻¹)		
	0-15 cm	15-30 cm	30-45 cm	0-15 cm	15-30 cm	30-45 cm	0-15 cm	15-30 cm	30-45 cm
V ₁	264	223	196	52	48	44	168	145	140
V ₂	290	250	218	50	45	42	144	135	130
V ₃	275	225	206	52	50	48	243	235	255
V ₄	272	245	212	20	18	15	296	278	250

V ₅	255	205	186	37	34	30	188	170	158
V ₆	240	198	179	33	30	28	201	185	175
V ₇	310	242	221	35	31	27	211	205	180
V ₈	234	186	162	24	22	20	145	128	125
V ₉	260	213	177	45	40	37	223	215	205
F- test	S	S	S	S	S	S	S	S	S
S.Em.	4.08	2.98	2.69	0.29	0.32	0.24	4.05	3.17	2.64
(±)									

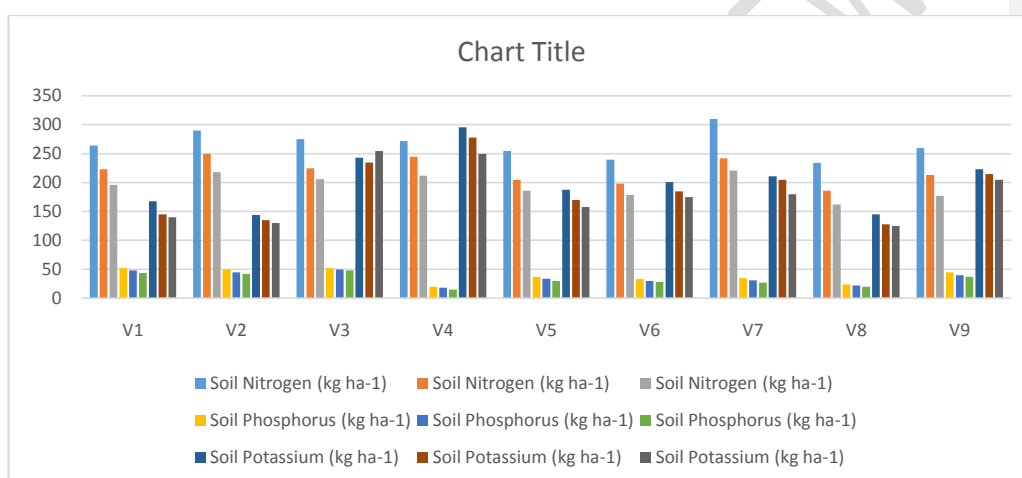


Fig. 4 Available nNitrogen, phosphorus, and potassium of soil samples in different villages of the Mandawar block.

CONCLUSION

It can be concluded that the soils of the Mandawar block of Dausa, Rajasthan are in good physical condition which favors the cultivation of most of the crops, especially maize and wheat. Soil texture showed a high clay percentage, neutral in pH, very low to low organic carbon content, and low to medium in NPK. The deficiency of nutrients can be

mitigated by the use of some inorganic fertilizers or organic fertilizers. Tolerant varieties can be used and Integrated Nutrient Management can be adopted.

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Comment [es2]: MUST BE UPDATED as 26.3% (5 out of 19) of the listed references were published in the past five years. The percentage has to increase to at least 35-40%. Old references negatively impact the study and indicate that the study is no longer a point of interest

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