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**Response of different
crops to Potash in
Gujarat State.**

RESPONSE OF DIFFERENT CROPS TO
POTASH IN GUJARAT.

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Potassium has been an important element in both agriculture and industry for many years. The agricultural use of potassium has increased greatly in the past fifty years. Potassic fertilizers are imported from foreign countries in India. The potash content of soils is variable and may range from only a few hundred kilogram per hectare furrowslice on coarse textured soils formed from sandstone and quartzite to 25000 kilogram or more in fine-textured soils formed from rocks high in K-bearing minerals.

REVIEW OF AGRONOMIC EXPERIMENTS ON
POTASH APPLICATION.

The results of a large number of field experiments conducted in India are summarized by ICAR (1967) indicating that K is not generally needed at the present level of crop production. A valuable treatise on this subject is also edited by Kilmer et. al. (1968). However, some of the recent work on this aspect has been reviewed here.

Bathkal et. al. (1970) have reported the results of a test carried out on Kharif sorghum CSH 1 under rain-fed conditions at Kolhapur farm during 1967-68 and 1968-69. There was no significant increase in grain yield due to application of 25 and 50 kg. K_2O per ha over the control. Shaikh et al. (1971) studied the effect of different

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respectively.

(2).

levels of N.P and K on the HCN content of sorghum plants. It was observed that potash application had no distinct effect on either decreasing or increasing the HCN content.

Gupta (1960) compared 4 rice varieties at 3 sra spacings and 6 fertility levels. It was noticed that on the average the response to potash was small on all soils. on the contrary peterson et al. (1971) found that paddy responded well to potash where the potash status was very low.

According to Gautam and Khare (1969), there was absence of significant response to potash on maize Ganga 101 over the standard rate of 60 kg. per ha potash at IARI, New Delhi. Khare and Gautam (1969) did not observe any residual effect of potash applied to maize on the succeeding crop of wheat in rabi and cow-pea fodder in hot weather season. No response to potash application was also observed by Tewary et al. (1970) at Rachi who studied the response of N, P and K on Ganga 101. Similar observations on Ganga 2 are reported by Singh et al. (1972).

Garg and Tomaria (1970) did not observe any response to application of 44.7, 67.0 and 89.3 kg. Potash per ha on wheat Sonora 64 at Sehore due to high potash status in the test plot soil.

Kanniya et al. (1968) conducted a fertilizer-cum-spacing study on P 216 F cotton in 1962-64 at Aduthurai and Manapparai (Tamil Nadu.) An application of 50 kg Potash per ha had no effect on ~~xxx~~ yield, staple length or ginning outturn. The data reported by Singh et.al. (1969) from Hissar on 320 F Cotton indicated that the mineral content was not affected by fertilizer application.

Moisture percentage was decreased and seed weight increased by potash application. Misra (1971) observed that potassic fertilization did not exert any marked effect on the yield of cotton. However, some response to potash application was observed at Khandwa and Indore. (Sing et al., 1971). Sambandam et al. (1971) reported that best ~~pot~~ yield of CMU 2 seed-Cotton was obtained when the NPK ratio in the plant at the first picking stage was close to 3.3:1:3.3.

Jain (1970) reported that significant differences were not obtained in seed yield and water use efficiency of castor due to potash application at Jodhpur. The effect on rate of ~~evapotranspiration~~ transpiration and oil content of seed was also insignificant.

Jones and Lutz (1971) indicated that the yield of soybean was increased by potash application. No such response to potash was obtained by sazena et al. (1971) on soybean because of high soil fertility.

Sharma (1970) reported that at Gurdaspur (Punjab) an application of 22 kg potash per ha increased the yield of lentil in 1964-65 and 1965-66.

Hukkeri (1968) revealed that increased application of potash up to 135 kg. per ha resulted in increase of 'Ware' -sized tubers and starch percentages but there was no effect on dry matter content at Kharagpur (West Bengal) in 1963-65. Seth et al. (1970) reported the results of 1450 trials conducted in 1963-66 on cultivators fields in Patna and Tripura districts, wherein no response to potash was observed on potato. However, Pushkarnath et al. (1971) found that an application of 101 to 182 kg potash per ha was optimum for up-to-date potato.

Singh et al. (1969) revealed that different levels of K did not exert any beneficial effect on the yield of different pea varieties at IARI, New-Delhi for three years (1958-59 to 1960-61). Khare et al. (1969) did not observe any residual effect of K applied to maize on the following crop of peas. Singh et al. (1969) did not observe any residual effect of K applied to maize on the following crop of peas. Singh et al. (1970) reported that the application of potash (levels of K_2O 0, 45 and 90 kg/ha) did not show beneficial effect on Golden Acre variety of cabbage at IARI, New Delhi during 1961-62 to 1963-64. Roy and Sheth (1970) did not obtain response due to higher level of potash over 30 kg/ha due to depressed growth of radish.

On the whole, the potassium status of Indian soils appears to be quite satisfactory. Hence, there seems to be fewer reported instances of crops responding to potash. This may be explained in part by very low consumption of N and P at present (Ignatieff and page, 1966).

POTASSIUM STATUS IN GUJARAT SOILS AND ITS UPTAKE.

The analytical data of about, 50,000 soil samples received from cultivators of Gujarat are reported by Kanwaria (1970). The status of available K in Majority of samples under different soil groups was low which has been presented in Table 1. The Soil Coordinator, Junagadh has also analysed 40,000 soil samples received from cultivators of Gujarat from different districts. Potash was determined by flame photometric method which indicated 57, 26 and 27 percent samples having high, medium and low potassium status in Gujarat Soils (Jadav, 1971) as shown in Table. 2.

Mishra and Raman (1972) have reported the findings pertaining to Kg O removal from the soil by various crops in different rotations and worked out the balance sheet of various nutrients in Soil. In a four-crop rotation, maximum K was removed. When pearl-millet was included in the rotation, it has a profound effect on the K removal (Table..3.)

RESPONSE OF DIFFERENT CROPS TO K APPLICATION GUJARAT.

Pearl-Millet.

No response to potash application was observed at any location during 1959 to 1970 on local, locally improved or hybrid varieties (Table 4). The results on HB 2 at Targhadia reported by Gopani and Paidá (1971) indicated no beneficial effect of potash upto 74/KG/ha when applied in combination with different doses of N and P. The results of trials conducted on cultivators' fields in Mehsana, Bhavnagar and Jamnagar districts showed significant increase in yield by application of potash (Table 5) in some of the experiments (I.C.A.R. 1970-72.).

Sorghum.

The response obtained at Surat was not significant (Table 6). However, at Chalthan, an application of 60 kg. K per ha had a slightly favourable effect (Table 7.) According to (I.C.A.R. 1970) the application of K increased the yield to some extent over N and P application in Bhavnagar district on cultivators' fields (Table 5.).

Paddy.

No response was noticed at several locations except at Nawagam where 45 kg.K₂O per ha increased the yield

significantly over the check in the case of J.280 variety (Table 8.). I.C.A.R.(1970-71) reported increase in yield was observed on cultivators' fields under irrigated as well as rainfed conditions in Surat and Bulsar Districts at several locations (Table 5). In an experiment conducted at the Agricultural Institute, Anand on five high yielding varieties in 1969-71, the yields obtained under N₂₁₀ P₁₀₅ K₀ and N₂₁₀ P₁₀₅ K₁₀₅ were 4735 and 4810 Kg/ha, respectively which were identical.

Maize.

In an experiment conducted at Godhra in 1965-67 and at Junagadh in 1970, no response to K application was noticed. The results are shown in Table 10. Patel (1971) studied the effect of fertilizers on three maize varieties. The yields obtained with N₂₅₀ P₁₂₅ and N₂₅₀ P₁₂₅ K₁₂₅ were found to be 4627 and 4774 kg/ha, respectively. Favourable response to K₂₅ was also observed on cultivators' fields (Table 5.).

Wheat.

Results of 12 locations are available wherein effect of potash application was studied in different years from 1965 to 1971. The data together with varieties tested are presented in Table 11. It is observed that there was no response of potash at any of the locations except at Jagudan where the response was noticed only at highest level. The results of an experiment conducted at the Agricultural Institute, Anand on wheat No. 824 from 1961-62 to 1963-64 are reported by Patel et al. (1969) wherein response to potash application has not been noticed.

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So was the case with high-yielding varieties (Table 12). However favourable response to K application was observed in the case of some of the experiments conducted on cultivators fields in Gujarat as shown in Table 5 (Anonymous, 1969; I.C.A.R.1970 1971,1972) .

Cotton.

The results of the trials conducted at Surat, Bardoli, Kholwad and Kim in 1957 to 1967 indicated no response to potash application on Vijalpa Cotton. The data on variety CJ 73 tested at Umralla in 1957-59 and on variety Deviraj at Kholwad in 1959-62 as well as of other varieties tested at Ratil and Chotila were also similar (Table 13).the results of Lamdhade (1957) also indicate no additional gain by potash application at Anand.

Oilseeds.

Response to potash application was studied on groundnut varieties Viz Panjab-1, AK 12-24 and AH-32 at six locations in different agro-climatic regions of Gujarat during the period from 1952 to 1965. The results did not show any significant increase in groundnut yield due to application of potash at different levels over the control. The details of the results are presented in Table 14. Similar results were obtained also at Junagadh and Amreli (Table 15,16.) However, the results from the ~~ext~~ trials conducted on cultivators' fields in Jamnagar and Surat districts in 1969-70 indicated a significant response to K application (Table 5) in groundnut (I.C.A.R.1970). Experiments conducted on castor hybrid 3 at Vijapur and Junagadh,

On sesamum at Manund and Umralla and Soybean Junagadh do not indicated significant response to K application (Table 17, 18 & 19)

Vegetable.

No response to potash application was observed in potato and onion tried at several locations, However, slight yield increase due to potash was noticed in Brinjal, tomato and chillies. The data are presented in Table 20. In an experiment conducted at Agricultural Institute, Anand, Parekh (1970) also did not notice any response of onion to potash application.

Tobacco.

Application of potash did not indicate any advantageous effect either on the yield or quality of bidi tobacco as observed by Patel (1960.) Similar observations are also noted by Patel(1960) and Fate.(1964).

application of potash did not improve the quality of tobacco in relation to N and nicotine content but in increased K content at Anand during 1970-71.

Sugar crops.

Significant response was not obtained due to application of various doses of potash to sugarcane in 1961-62 to 1965-66 at Kodinar and Vyara (Table 22.) Similar results were observed at anand for sugar beet in 1970-71(Table 23.)

Fodder Crops.

Experiments conducted at Anand on lucerne as well as different varieties of cowpea and clusterbean crops did not indicate favourable response to K application except slight increase in green fodder yields of lucerne at high level of K application (Table 24.).

SUMMARY AND CONCLUSION.

Due to a fairly high status of potash in Gujarat Soils, no response to its application has been observed on most of the crops in general. Some of the results on farmers' fields, however, seems to be promising which indicated the need for comprehensive testing.

SUGGESTIONS ON FUTURE LINE OF WORK.

1. Soil test values will have to be interpreted on the basis of soil test crop response correlation studies which need urgent attention.
2. As the results of research stations, differ from the tests on cultivators' fields, more experiments under such conditions may be planned to verify the results obtained so far.
3. Studies on uptake of potash by different crops may be intensified. Such studies should be an integral part of the experiments on fertilizer trials.
4. Basic studies on leaching, availability and fixation of potash during the growth period of different crops may be attended to.
5. Trials may be initiated to study the response at higher K rates as well as on time and method of potash application.
6. Response to potash may be specially studied under higher production levels in intensive rotations.

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Table 1. Status of available K in different soil groups of Gujarat.

Soil Group.	% of samples falling in the categories of available potash.		
	Low.	Medium	High.
Medium black.	62.56	30.20	7.24
Deep black.	62.97	32.56	4.47
Alluvial Sandy	56.16	30.47	13.37
Alluvial sandy loam	49.04	37.87	13.09
Lateritic.	7.14	92.86	-

Table.2. Available potash status in different districts of Gujarat Soils (1970-71).

District.	Total samples analysed.	% Samples in the category of.		
		Low. 80-140.	Medium 140-448.	High. 448 kg/ha..
Jamnagar.	122	25	54	21
Rajkot	1276	24	48	28
Surendranagar	4431	23	53	24
Bhavnagar.	2596	7	33	60
Amreli.	1349	14	15	71
Junagadh	6833	37	39	24
Kutch	819	12	32	56
Sabarkantha	433	0	30	70
Mehsana	1027	0	9	91
Ahmedabad.	582	0	9	91
Kaira.	3601	14	36	50
Panchmahal	337	22	27	51
Baroda	30	10	33	57
Broach.	1462	32	16	52
Surat	9456	26	13	61
Dang.	56	34	16	50
Gandhinagar	347	00	12	88
Bulsar	3277	14	10	76
Banaskantha	2176	1	14	85
Total.	40210	17	26	57.

Table. 15. Potassium removal from the soil in different rotations at the Institute of Agriculture, Anand during 1967-70.

Rotational treatments.	K ₂ O removal kg/ha*
1. Tobacco- Tobacco.	18
2. Early mung-Tobacco-summer bajra	235
3. Early mung-Transplanted bajra-wheat summer bajra.	462
4. Early mung-transplanted bajra-wheat vegetable crop.	365
5. Soyabean - Sundhia Jowar-wheat-summer bajra.	295
6. Early mung-hybrid castor-summer bajra	198
7. Hybrid cotton + Soybean mixture-summer in bajra.	131
8. Soyabean -Hybrid maize-wheat.	251
9. Hybrid bajra-Lucerne.	418
10. Soyabean- Sundhiya jowar-sugarbeet.	175.

*

Only sugarbeet crop was fertilized in 10th rotation with 150 kg K₂O /ha. Thus all the K removed from the soil was from native soil K.

Table.4. Effect of varying levels of K application on different pearl-millet varieties at various locations in Gujarat (grain yield kg/ha)

Location.	Variety.	Year.	Level of K application.C.D.			
			0.	22.5	45.0.	71.0. 5%
Jamkhambhali.	Local	1969	252		228	N.S.
	HB 3	1967-68 70	898			897 N.S.
Kothara	N23-15-2	1961-65	314	295	317	N.S.
Junagadh.	Babapuri	1960-62	697	653	715	
Kodinar	Babapuri		310	328	336	
Jamanagar	Local		343	349	333	
	Babapuri					
Mmrjala	N23-15-2		627	537	540	
Kothara	HB 2	1966	903			910
Talod	HB 2	1966	825			790
Targhadia	HB 2	1966	1249			1293
Jamanagar	HB 2	1966	605			581
Junagadh	HB 2	1966	2317			2330
Deess	HB 2	1966	1741			1747
Talaja	HB 2	1966-68	2234			2222 N.S.
Vijapur	HB 2	1966	1796			1769
Junagadh	HB 3	1967-69	2353			2367 N.S.
Jamnagar.	HB 3	1967-69	21325			1311 N.S.
Talod.	HB 3	1967-69	1943			1963 N.S.
Vijapur	HB 3	1967-69 70	2387			2952 N.S.
Deesa.	HB 3	1967-69 70	1831			1882 N.S.
Kothara	HB 3	1967,70	1808			1850
Chotila	HB 3	1968,69 70	1651			1767 84

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Table 5. Results of simple fertiliser trials on cultivators fields conducted in Gujarat State for different crops.

PEERU---MILLET.

District.	Variety.	Average yield of untreated plot kg/ha.	Response to.							
			N50 P25	N60 P30	N120 P60	N50 P25 K25	N60 P30 K30	N120 P60 K60	SEM at 5%	C.D.
Jamanagar	I HB2(12)*	790	-	716	-	-	820	-	62	121
	I Local(5)	1252	-	872	-	-	904	-	-	-
	+ R HB2(11)	590	-	447	-	-	520	-	29	58
	R Local(16)	615	-	423	-	-	509	-	28	54
Mehsana	I HB3(19)	2203	-	-	615	-	-	533	89	175
	IN207(19)	1488	-	-	712	-	-	671	85	164
	R HB3 (33)	1355	-	-	401	-	-	585	73	142
	R N207(33)	1441	-	-	396	-	-	457	121	237
		<u>1970-71.</u>								
Bhavnagar	I HB3 (17)	1695	-	-	862	-	-	-1006	87	171
	I Local(21)	1047	-	-	654	-	-	674	44	87
	R HB3 (49)	1696	-	-	1154	-	-	1323	46	91
	R Local (35)	938	-	-	548	-	-	663	30	58
Mehsana.	R HB3 (5)	1790	-	-	1216	-	-	1240	113	221
	R J104(49)	1868	-	-	784	-	-	1025	37	72
	R N207(55)	1407	-	-	727	-	-	900	35	79
Jammagar.	R HB3 (60) (Beco)	1049	914	-	-	1075	-	-	18	35
	R HB3 (60) (Nor)	1079	824	-	-	952	-	-	18	35

 1971-72.
 District. Variety. Average yield of untreated plot kg/ha. N30 P120 Response of K over N30 P120. SEM C.D. + at.

Junagadh.	I HB3(7)	1090	1510	87	-124	164	-	-
	R HB3(15)	1046	1336	76	-115	-224	85	166

N50 P25 Response of 25kg K over N50 P25.

Jammagar	R HB3(42) (Recd).	933	1041			1233	17	33
	R HB3 57 (not).	911	1022			1156	29	57

SORGHUM.

Average response to
 N120 P60 N120P60K60 SEM C.D.
 + @
 - 5%

 1969-70.

Bhavnagar	I ^o CSH1(34)*	1388		704		865	70	138
	IE56(37)	810		431		504	41	87
	R ⁺ CSH1(14)	1443		1238		1534	99	194
	R IE56(15)	796		753		854	45	88

PADDY.

Average response to..
 N60P30 N60P30K30.

 1969-70.

Surat.	I 231(12)	1418	993	1097			35	64
	R 231(3)	1970	729	880			77	150
	R Local(10)	1119	450	593			35	64

1970-71. N120 P60. Response of K over N120P60.
 30 60 90.

Bulsar	I Mussoorie(12)	3164	4334	211	-47	331	107	221
	R Mussoorie(13)	3664	4469	193	47	344	147	297
			N120 P100	Response of K over.				
				30	60	90		
I Mussoorie								
	LM(5)	3374	4546	825	-375	1260	397	806
	LF(3)	2416	3092	916	616	1594	381	800
	MH(3)	3686	4392	824	91	1232	496	1042

District.	Variety.	Average yield of untreated plot/kg/ha.	..20.. Response of K over			SEM +	C.D. @ 5%.	
			N120 P120.	N120 P120.	P120.			

1971-72.								
Junagadh	I ^o Ksona (46)*	1901	3345	145	-169	263	66	129
			N120 P100	Response of K over N120P100.				
				30	60	90		

Junagadh.	I ^o Ksona (4)	1690	4048	38	-108	203	232	468
	LM(4)	1587	3987	-122	-130	127	223	446
	LH(5)	2255	3987	161	150	220	281	566
	MH(3)							

<u>GROUNDNUT.</u>			<u>Response to.</u>					
			N30P30	N30P30K30.				

1969-70								
Mamagar.	I Samarala (2)	1106	722		972		26	52
	R ⁺ Samarala (28)	720	264		430		15	30

Surat.	R Local (53)	1160	496		606		13	26

o I --Irrigated crop.

* --Number of trials.

+ R --Rainfed crop.

Reco.--Recommended practices for moisture conservation.

Nor.-- Normal Practices followed by cultivators.

+ LM.-- Low P₂O₅ medium K₂O in the soil before sowing.

+ LH. --Low P₂O₅ high K₂O in the soil before sowing.

+ MH -- Medium P₂O₅ high K₂O in the soil before sowing.

...21..

Table .6. Response of Jowar (BF 53) to K application at surat during 1957-59..

K ₂ O Kg/Ha.	Mean grain yield, Kg/Ha.			
	1957	1958	1959	Mean.
0	933	924	1290	1069
33.6	1060	1029	1168	1086
67.2	1045	932	1195	1074.

Table 7. Response of Jowar varieties to K application at Chalthan, District Surat.

K ₂ O kg/ha.	Mean grain yield kg/ha.			
	1967	1968	Mean	1968*
0	450	1497	974	2094
30	492	1390	941	2205
60	579	1695	1107	2201
S.E. ±	21			
C.D at 5%	60			

* These data are derived from another experiment.

Table 8. Response of different paddy varieties to K application (mean grain yield, Kg/ha.).

Location	Variety	Period of Experimentation.	K ₂ O level kg/ha.					C.D. @5%
			0	34	45	63	90	
Nawagam.	J 230	1956-1959	3232	3312		3368		
	J 230	1961-1964	3940			3935	3977	N.S.
		1965-1967	3873			4025		136
	S 20	1961-1965	3230			3153	3112	N.S.
		1965-1967	4741			4755		N.S.
Bardoli.	Z 31	1959-1962	3030			2961	2954	
Chikhli.	Z 31	1959-1962	2432			2446	2423	
		1960-1962	3433	3039			2873	
Vyara	Z 31	1955	2633			2477	2503	

Table No. 9. Effect of fertilizer doses on Nawagam 19 paddy on cultivators' fields at Nawagam in 1970.

Cultivator	Shri. M.M.Patel.		Shri. C.M.Patel.			
	Treatment	Grain.	Fodder.	Treatment.	Grain	Fodder.
Nawagam 19	N ₁₀₀ P ₀ K ₀	4338	5199	N ₁₅₀ P ₀ K ₀	4439	5227
	N ₁₀₀ P ₅₀ K ₀	4471	5526	N ₁₅₀ P ₆₀ K ₀	3974	5119
	N ₁₀₀ P ₀ K ₅₀	4382	5051	N ₁₅₀ P ₀ K ₆₀	4099	4761
	N ₁₀₀ P ₅₀ K ₅₀	4375	5021	N ₁₅₀ P ₆₀ K ₆₀	4224	5119
	Control	2793	3773	Control	3329	4224.

Table 12 Abstract of the results of the experiment conducted at Anand to study the effect of NPK on high-yielding wheat varieties * (yield, kg/ha).

Treatment Kg/ha.	Grains.		Fodder.	
	1969-70	1970-71	1969-70	1970-71.
N ₁₅₀ P ₇₅ K ₀	4422	4052	4323	5622
N ₂₁₀ P ₁₀₅ K ₀	4313	4104	5017	5715
N ₂₁₀ P ₁₀₅ K ₁₀₅	4369	4116	5312	6246
SEM	56	90	123	96
CD at 5%	NS	NS	330	272

Table 13. Response of different cotton varieties to potash application (mean seed cotton yield, kg/ha)

Location, Variety	Year of test.	Level of K ₂ O kg/ha				
		0	25.0	33.06	50.0	67.2 134.4
Surat . Vijalpa	1957to1959	343				348
Bardoli Vijalpa	1958to1961	775				713 743
Kholwad Vijalpa	1960 to1962	1013				918
Keem Vijalpa	1960 to1962	371				369
Umralla CJ 73	1957 to 1959	668		640		556
Kholwad Deviraj	1959 to 1962	1013				978
Ratia (Mumad) Kalyan) V 737)	1967 to 1970	779	754			
Chotila V 737) CH 73)	1967 to 1970	396			444	

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Table 14. Response of different varieties of groundnut to K application (Mean yield of pods, kg/ha).

Location	Variety	Period of test.	Level K ₂ O tested, kg/ha.										
			0	14	22.4	25	28	30	44.8	56	60	112	224
Junagadh.	Punjab-1	1952-1954	1,118					454				1,1120	
	Punjab-1	1955-1958	1,266				1,039				1,265		
	Punjab-1	1959-1962	1,001				1,039				1,019		
Talod	A H 32	1957-1960	1,309									1,317	1,334
Amreli.	A H 32	1959-1962	1,072									1,034	1,013
		1958-1961	685					687					
Halvad	A K 12-24	1958-1962	436					437					
Kothara	A H 32	1961-1965	1,179		1,171					1,134			
Jamnagar	Punjab.1	1962-1965	852	865		872							

Table 15. Response of Junagadh 11 groundnut to different fertilizer levels (Yield of pods, kg/ha)

Treatment.	Junagadh.		Amreali.
	1970	1971	1970.
N ₀ P ₀ K ₀	1615	766	1623
N ₄₀ P ₈₀ K ₀	1835	985	1667
N ₂₀ P ₄₀ K ₀	1732	904	1667
N ₂₀ P ₄₀ K ₂₀	15969	902	1655
Index CD at 5%		96	

Table 16. Response of Junggadh II groundnut to NTK at Junggadh.....

Treatments Kg/ha.	Yield in kg/ha..					
	Pods.			Fodder.		
	1970	1971	Mean	1970	1971	Mean.
N ₀ P ₀ K ₀	1142	1185	1134	1811	1510	1661
N ₀ P ₀ K ₄₀	1232	1514	1373	1886	1912	1899
N ₄₀ P ₄₀ K ₀	1333	1992	1633	2133	2365	2252
N ₄₀ P ₄₀ K ₄₀	1233	1997	1643	1361	2365	2113
N ₄₀ P ₃₀ K ₀	1449	2227	1830	2113	2617	2365
N ₄₀ P ₃₀ K ₄₀	1464	2236	1350	2188	2617	2403
C.D. 5%	NS	236				

Table 17 Abstract of the results of an experiment to study the response of castor hybrid 3 to spacing and fertilizer in 1970.

Treatments. Kg/ha.	Vijapur	Junggadh.
N ₀ P ₀ K ₀	597	1033
N ₄₀ P ₄₀ K ₀	1717	1327
N ₄₀ P ₃₀ K ₀	1930	1396
N ₄₀ P ₄₀ K ₄₀	1811	1504
C, D. at 5%	66	177

Table 13 Abstract of results of an experiment to study the effect of plant population, spacing and fertilizer on sesamum Patan 64 (Yield in kg/ha).

Treatments. Kg/ha.	Manund.		Mean.	Umrjala.
	1970	1971		1971.
N ₀ P ₀ K ₀	260	296	278	411
N ₂₅ P ₂₅ K ₀	432	381	407	475
N ₅₀ P ₅₀ K ₀	434	460	447	572
N ₅₀ P ₅₀ K ₅₀	458	484	471	579
CD 5%	93	34		114

Table 19. Abstract of results of an experiment to study the effect of spacing and fertilizer on soyabean at Junagadh in 1971-72.

Treatments Kg/ha.	Yield of grains, kg/ha.	
	J 265	I 231
N ₀ P ₀ K ₀	595	1424
N ₂₀ P ₂₀ K ₀	664	1635
N ₂₀ P ₂₀ K ₄₀	715	1622
N ₄₀ P ₃₀ K ₀	813	1640
N ₄₀ P ₃₀ K ₈₀	850	1807
CD at 5%	240	73.

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20.

Table 20. Response of various vegetable crops to potash application at different locations (mean yields kg/ha).

Crop	Location	Period of test	Level of K ₂ O kg/ha.				
			0	22.5	33.6	44.8	89.6
Potato	Pilwai	1965-66 to 63-69	10153	9941	10033		
	Deesa	1967-68	24084	24482	24239		
Onion	Jamnagar	1965-66 to 67-68	11417	11107	11113		
	Pilwai	1965-66 to 68-69	23535	23237	23293		
	Bardoli	1966-67 to 68-69	12172	13116	14894		
	Deesa	1967-68	10021	9734	9746		
	Talaja	1968-69	22800	23522	23640		
Level of K ₂ O			0	22.5	33.6	44.8	89.6
Brinjal	Junagadh	1960-61 & 5593 1962-63				5773	5534
	Pilwai	1963-64	1619	1999			
	Thasra	1963-64	3116	3454			
Tomato	Umralla	1963-64	6322	6631			
Chillies	Chanasma	1963-64	3682	4326			

Table. 21. Effect of Potash application on tobacco quality at Anand 1970-71.

Treatment	Non dry wt. basis.		
	N	Nicotine	K.
A. Soil application of K_2SO_4 @ 90 kg K_2O /ha	3.01	8.47	0.67
B. Soil application of K_2SO_4 @ 130 kg K_2O /ha	2.95	8.44	0.95
C. Foliar application of 5% K_2SO_4 @ 90 kg K_2O /ha at at weekly intervals 6 weeks after transplanting.	2.95	8.04	0.70
D. Soil application of K_2SO_4 @ 90 kg K_2O /ha + foliar application of 5% K_2SO_4 @ 90 kg K_2O /ha at weekly intervals 6 weeks after transplanting.	2.93	8.54	0.93
E Control.	2.95	7.99	0.60
SEM ±	0.06	0.13	0.06
CD at 5%	NS	NS	0.20
CV	4.15	4.5	17.30

Table 22. Response of Sugarcane Co 419 to Potash application (Mean cane yield tonnes/ha)

Location	Period of test.	Level of K ₂ O, kg/ha.			
		0	37.5	50	75.
Kodinar	1961-62 to 64-65	69.96	71.61		70.72
	1961-62 to 65-66	69.19		65.21	
Vyara.	1961-62 to 65-66	73.66		76.21	

Table 23 Response of sugarbeet varieties to fertilizer doses at Anand in 1970-71.

Treatment kg/ha.	Yield tonnes/ha	Sugar %
N ₁₅₀ P ₇₅ K ₁₅₀	50.257	15.53
N ₂₀₀ P ₁₀₀ K ₀	52.667	15.39
N ₂₀₀ P ₁₀₀ K ₁₀₀	54.671	15.18
N ₂₅₀ P ₁₂₅ K ₂₅₀	54.934	15.79
SEM +	1.974	
CD at 5%	N.S.	

Table No.24 Abstract of experiments at Anand to study the effect of P K on fodder crops at Anand (Yield q/ha).

Treatment Kg/ha.	Lucerne sirsa 2 (1970-71)		Cowpea (1971-72.)		Cluster bean (1971-72)	
	Green	Dry.	Green	Dry.	Green	Dry.
K ₀₀	647.3	131.5	339	46	163	35
K ₃₀			331	45	163	37
K ₄₀	668.9	133.4				
K ₃₀	676.1	135.9				
SEM +	7.6	1.5	6.8	0.9	3.7	0.8
CD at 5%	21.6	NS	NS	NS	NS	NS.