sufficient income are lacking, implementing officers lack adequate powers to take suitable action in case of misuses of assets and lack of cooperation extended by banks for family oriented programme were also important among the first ten problems perceived by them. The pooled rank based on the total score obtained by both the category of officials combined is given in Table 3.

According to pooled rank (Table 3) also, misutilization of assets by beneficiaries has emerged as the most important problem. A critical examination of the subsequent problems which topped the list would reveal that they, in fact, unravel the reasons for the misutilization of assets. For instance, beneficiaries lack necessary mangerial ability to take care of the assets provided, block officials lack adequate transportation to reach beneficiaries efficiently and 'economically viable assets capable of generating sufficient income are lacking' are problems that lead to misutilization of assets.

The study of officials' perception of selected problems reveals that 'misutilization assets by beneficiaries' is by far the most important problem. Based on the findings of the study more attention must be given to training the beneficiaries in the management of the assets given to them and block level functionaries particularly Village Extension Officers should be provided with adequate transportation to reach beneficiaries efficiently.

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EFFECT OF IRRIGATION MANAGEMENT AND NITROGEN FERTILIZATION OF SHELFLIFE OF MAIZE

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ABSTRACT

Maize (CO 1) was subjected to different irrigation methods (all furrow, alternate furrow and skip furrow), irrigation levels (IW/CPE ratio of 0.50 and 0.75) and nitrogen levels (75,125 and 175 kg/ha). Seeds harvested were dried to 10 ± 0.5% moisture content and stored in 700 gauge polyethylene and gunny bags under ambient conditions of temperature and relative humidity. The storability of seeds obtained from different irrigation and N management was determined during the year 1990-91, through the parameters *viz.*, germination (%), seedling vigour, electrical conductivity (umhos/cm), sugars (g) aminoacids (g) protein content (%) and dehydrogenase activity (OD value). The seeds obtained from plants irrigated to the level of 0.75 IE/CPE ratio through all furrow method and supplied with 175 kg N/ha stored better than those of other treatments. The seeds stored in 700 gauge polyethylene bags maintained better viability and vigour during storage than the seeds stored in gunny bags.

KEY WORDS : Maize, shelf life, storage

Maize (*Zea mays* L.) occupies the fourth position in total production of food grains. It is grown over an area of 5.81 mha with the production 7.41 m tones. The influence of irrigation and nitrogen levels on seed yield and quality has been studied by many workers. Few scientists have explored the influence of irrigation and N levels on the shelf life of the resultant seeds. Plant species differ widely in their water requirement. Management decisions concerning N and water input should be based on the knowledge of the interactive effects of both inputs on crop productivity, quality and storability. Hence, the present study was taken up to study the effect of combining methods and levels of N on the shelf life of maize seeds, when stored in polythene bags (700 gauge) and gunny bags.

MATERIALS AND METHODS

A trial CO.1 maize was set in split plot design and replicated thrice. The crop was subjected to two levels of irrigation treatments *viz.*, IW/CPE

ratio of 0.50 (5 irrigations) and 0.75 (8 irrigations). Three methods of irrigations all furrow, alternate furrow and skip furrow were compared. The treatments with N included three levels *viz.*, 75, 125 and 175 kg/ha. The resultant seeds from the above treatments were dried to 10±0.5% moisture content and graded with 18/64" (dia 7.2 mm) round perforated sieve. The seeds retained were treated with 2g of thiram (75%WP) and 200 mg of BHC (50%WP) for every kg of seed and stored in fresh gunny bags and 700 gauge polythene bags for ten months under ambient conditions of temperature and relative humidity. The stored seeds were analysed at bimonthly intervals for moisture content (MC), germination, seedling length (SL), drymatter production (DMP) and vigour index (VI) using standard procedures. The biochemical tests were carried out with seed leachates prepared from four replications of 20 seeds, from each treatment. Seeds were surface sterilised for 10-15 min in 0.1% mercuric chloride solution. Seeds were then rinsed with distilled water and soaked in 20 ml distilled sterile water for 15 h at room temperature. After 15 h, the soaking medium was decanted. The seed leachates were tested for electrical conductivity (EC) sugars, aminoacids, protein and dehydrogenase activity, by using standard procedures. The results were subjected to an analysis of variance and tested (t- test) for significant differences (P=0.25) after Panse and Sukhatme (1985). Percentage values based on number were transformed into are-since values prior to analysis.

RESULTS AND DISCUSSION

Highly significant differences were noticed between irrigation levels, methods, N levels, periods of storage and storage containers for seed germination, SL, VI, EC, sugars, aminoacids, protein and dehydrogenase activity.

The irrigation level of 0.75 IW/CPE improved the storage potential of maize seeds in terms of all the physiological quality attributes *viz.*, seed germination, root length, shoot length, DMP and VI. The percentage increase over 0.50 IW/CPE was 4.76,15.0.6.0, 16.6 and 22.6 respectively. Among the three methods of irrigation compared, all furrow and alternate furrow methods were superior over skip furrow method. N application at the rate of 175 kg/ha maintained better vigour in storage. The per cent increase over 125 kg/ha was 1.7, 1.9, 3.1, 2.2 and 4.5 respectively for germination, root, shoot length, DPM and VI. Irrespective of the treatments, the physiological quality attributes of the seeds declined as the storage period progressed. The ultimate parameter, germination was 96.2 per cent initially and 77.6 per cent after 10 months of storage. Similarly VI decreased from 31.0 to 15.7. The superiority of 700 gauge polythene bags over gunny was endorsed by the results of the present experiment by recording higher germination percentage and vigour throughout the study (Table 1).

The possible reason attributed for higher germinability of the resultant seeds from 0.75 IW/CPE might be due to optimal supply of water aiding proper development and maturation of seeds with maximum accumulation of essential nutrients, eventually, the storage potential (Barton, 1961) and the nutrient status of the seed (Pollock and Roos, 1972). The impressive effect of N on initial seed germinability and storage potential is in confirmity with Sikder (1965) in rice. Harrington (1960) indicated that seeds from N deficient plants recorded lower germination in storage.

The possible cause of seed deterioration include depletion of food reserves and enzyme degradation and inactivation. As seeds age and natural deterioration proceed, degradation and disorganisation of cellular membranes may occur, allowing nutrients to be leached from them in the presence of water. Against this principle, in the present estimation on protein and aminoacids was conducted as a measure of seed vigour. The dehydrogenase enzyme activity of imbibed seeds is measured since its activity is proportional to seed respiration and breaking down of food reserves during germination. The measure of electrical conductivity and sugar content of the seed leachates serves to explain the cell membrane integrity and inturn the seed viability and vigour (Agrawal and Siddique, 1973).

The mean protein content of seeds decreased with the increase in storage period irrespective of treatments and containers with simultaneous increase in the content of amino acids. Among the irrigation levels compared, 0.75 IW/CPE ratio

Table 1. Effect of irrigation management, nitrogen fertilization, periods of storage and containers on germination, root length, shoot length, dry matter production and vigour index of maize (Co1).

Treatments	Germination (%)	Root length (cm)	Shoot length (cm)	Drymatter production (cm) (mg/10plants)	Vigour index
Irrigation levels (IW/CPE)					
0.50	84.0 (66.93)	18.9	17.8	163	14.1
0 75	88.8 (71.23)	21.8	20.2	190	17.3
CD (P=0.05)	0.45	0.3	0.23	1	0.24
Irrigation methods					
allfurrow	87.5 (70.18)	20.9	19.8	182	16.3
Alternate Burrow	87.5 (69.93)	20.8	19.6	181	16.2
Skip Burrow	84.0 (68.17)	19.2	18.1	167	14.5
CD (P=0 05)	0.56	0.3	0.32	11	0.30
Nitrogen levels					
75	85.3 (68.06)	19.8	18.6	172	14.4
125	86.7 (69.51)	20.4	19.1	177	15.7
175	87.0 (69.61)	20.8	19.7	181	16.4
CD (P=0.05)	0.56	0.3	0.32	NS	0.30
Container of storage					
Gurry bag	86.0 (68.68)	19.7	18.4	169	15.0
Poly bag	87.3 (69.65)	21.0	20.0	184	16.4
CD (P=0.05)	0.46	0.3	0.26	1	0.24
Methods of storage					
Initial	95.2 (77.46)	26.2	24.5	325	31.0
Two	91.7 (73.80)	21.4	22.6	180	16.6
Four	87.7 (69.71)	20.1	20.5	170	14.9
Six	84.3 (66.80)	19.2	18.1	147	12.6
Eight	81.9 (65.04)	17.9	16.7	125	10.3
Ten	77.60 ((61.08)	7.2	12.8	112	8.9
CD (P=0.05)	0.79	0.5	0.45	12	0.42

Interactions effect are not shown in the table)

recorded a protein content of 9.69 per cent. Aminoacid (ug) recorded was 55.0 (0.75 IW/CPE) and 75.5 (0.50 IW/CPE) over ten months of seed storage. All furrow method registered its superiority by recording highest protein and lowest amino acid content. Among the N levels, 175 kg/ha recorded the highest protein value and lowest amino acids. Seeds stored in 700 gauge polythene bag registered higher protein content and lower aminoacid. The measure of dehydrogenase activity revealed the superiority of the irrigation level of 0.75 IW/CPE, all furrow method of irrigation and N level of 175 kg/ha. However, all furrow method of irrigation was on par with alternate furrow method. The measure of seed membrane integrity interms of EC and sugars toed the same line of results. The

Table 1. Effect of micronutrient application on yield, yield attributes and economics

Treatment	Dry pod yield (kg/ha)	Shelling (%)	100 kernel weight (g)	Sound matured kernel (%)	Net returns (Rs/ha)	Benefit cost ratio
T1	1202	71.7	30.3	71.3	7447	2.81
T2	1795	76.2	39.5	85.7	12543	3.61
T3	1633	73.7	37.0	81.9	11130	3.36
T4	1594	73.6	35.5	80.2	10709	3.26
T5	1629	72.9	36.5	82.3	11161	3.41
T6	1640	74.6	36.2	82.8	11412	3.56
T7	1525	74.4	34.2	78.8	10078	3.16
T8	1511	73.5	34.6	79.1	10065	3.22
T9	1479	72.5	33.4	76.5	9750	3.13
T10	1539	72.1	35.0	79.9	10485	3.40
T11	1488	72.3	33.7	78.0	9980	3.28
T12	1546	74.9	34.0	79.6	10608	3.48
T13	1400	73.9	32.9	74.4	9045	3.02
T14	1432	74.8	34.3	76.0	9526	3.22
T15	1454	73.0	34.4	77.3	9847	3.35
T16	1041	73.5	33.3	74.0	9334	3.21
SE_D	33.93	0.83	0.90	0.85	250.1	0.10
CD	69.30	1.70	1.84	1.79	510.5	0.21

T_1 : NPK alone; T_2 : NPK + gypsum + Zn + Fe + B; T_5 : NPK + Zn + Fe + gypsum T_4 : NPK + Zn + B + gypsum : T_5 : NPK + gypsum + Fe + B ; T_6 NPK + Fe + Zn + B T_7 : NPK + gypsum + Zn ; T_8 : NPK + Fe ; T_9 : NPK + gypsum + B T_{10} : NPK + Fe + Zn; T_{11} : NPK + Zn + B ; T_{12} : NPK + Fe + B ; T_{13} : NPK + gypsum T_{14} : NPK + Zn ; T_{15} : NPK + Fe ; T_{16} : NPK + B

and iron, application was done at the time of pegging (45th day) @ 500 kg ha^{-1} and 1 per cent $FeSO_4$ spray, respectively. All standard procedures relating to crop cultivation, recording yield and other components were followed.

RESULTS AND DISCUSSION

The dry pod yield was greatly influenced by the treatments (Table 1). It was seen that application of micronutrients along with major nutrients increased the yield of groundnut to a considerable extent. Treatment T_2 (NPK + gypsum + Zn + Fe + B) recorded the maximum pod yield of 1795 kg ha^{-1}. Shelling per cent, sound matured kernel per cent and 100 kernel weight were also higher in this treatment (T_2), which together contributed to the increased yield recorded under this treatments. Applications of NPK alone (T_1) without gypsum and other micronutrients resulted in lowest groundnut yield (1202 kg ha^{-1}). There was significant response to application of each of gypsum, zinc, iron and boron (T_{13} - T_{16}). When NPK fertilization was combined with application of two or three of the inputs, there was significant enhancement in groundnut yield (T_3 - T_{12}) compared to application of single micronutrient or its non application. In general, the response of gypsum and boron was less compared to zinc and iron.

Both net returns and benefit cost ratio followed a trend similar to that of groundnut pod yield. T_2 i.e. application of micronutrients and gypsum along with the recommended dose of NPK recorded the highest net returns (Rs. 12543 ha^{-1}) and benefit cost ratio (3.61). There was response to each of the inputs studied, either for single or combined application. When micronutrients and gypsum were not applied (T_1), net returns (Rs. 7447 ha^{-1}) and benefit cost ratio (2.81) were drastically affected.

From this study it is concluded that there was response for gypsum, zinc, iron and boron either applied singly or in combination. In addition to basal application of macronutrients, when borax and $ZnSO_4$ were applied @ 5 kg ha^{-1} and 25 kg ha^{-1} along with application of gypsum @ 500 kg ha^{-1} and 1 per cent $FeSO_4$ spray on 45th day, highest yield and income were recorded.

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