# EFFECT OF PHOSPHORUS AND ZINC APPLICATION ON YIELD AND NUTRIENT COMPOSITION OF RICE CROP WITH WATER SALINITY

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**Abstract:** Two year pot experiment were conducted in green house to study the effect of phosphorus doses viz-P-40,$P_2$-80; $P_3$-120 kgha$^{-1}$. Four levels zinc sulphate viz-Control, $Zn_1$-25, $Zn_2$- 50 and $Zn_3$-75 kgha$^{-1}$and three levels of water salinity viz-ECo- Control $EC_1$ 8, and $EC_2$-16 dSm$^{-1}$, significantly decreased grain yield with increasing levels of salinity yet increased higher dose of P and Zn. The maximum grain yield was recorded at $P_2$ (80 $p_{2O5kg}$ ha$^{-1}$) and $Zn_2$ (50 kg ZnSo4 kgha$^{-1}$) and yield to extent of 19.04 and 28.96% and 46.11 and 43.24% during 1$^{st}$ and 2$^{nd}$ years respectively. The incensement of EC significantly decreased P.K. Ca and Zn increased N and Na content (%). The P and Zn application significantly increased the N,K and Ca. However incensement doses of P increased P content (%) but Na & Zn content (%) decreased. While zinc sulphate application enhanced the Zn content (%) and decreased that of P and Na contents.

**Keywords:** EC, N; P; K, Ca, Na, Zn, Content (%), yield and salinity

## ITRODUCTION

Rice is the seed of the monocot plants oryza Sativa. As a Cereal gain, it is the most widely consumed staple food for mostly Indian human population, and food security systems play a main role contribution over 40% of the total food grain production and grows in different agro-climate over 45 million hectors but productivity is very law caused by various factor in which main caused fertilization and quantity & quality of irrigation water. The Rice crop generally fertilized by N.P.K. only, Though zinc is equally Key role as it increase yield and is a quality Nutrients. In fact proper application of Zinc improves growth and Nutrients availability Kumar *et. al* .(1999). Natural resource of safe water very limiting in India especially semi-arid tract of Agra region in underground water saline-sodic and its major source of irrigation. The EC of underground water in Agra district various from-0.4 to 48.00 dSm$^{-1}$ Pal and Tripathi (1978). However, the continuous use of such water would develop salinity hazards Tripathi & Pal (1980). Thus the present experiment was planned to assess the effect of phosphorus and zinc sulphate fertilizer in saline water condition on rice crop.

## MATERIAL AND METHOD

In a pot experiment were conducted in green house in the department of Agriculture chemistry & Soil science R.B.S.College Bichpuri, Agra during the session July 1998 and July 1999 on a sandy loame soil having the following properties ECe 2.3 dSm$^{-1}$, pH-8.5, ESP-7.3. Salable cation (Mel$^{-1}$) [$Ca^{++}$-4.2, $Mg^{++}$-5.3, $Na^{+}$-12.2 and $K^{+}$-0.2]. Soluble anions (Mel$^{-1}$) [$CO3^{-}$-Nill, $HCO3^{--}$-7.3, $CI^{-}$-6.8, $SO4^{-}$-8.1]. Organic Carbom 0.14% and available N.P.K. and Zinc in soil 178.0, 12.5, 205 kgha$^{-1}$ and 0.56 Mgkg$^{-1}$ respectively. The experiment Laid out in factorial C.R.D. Desion with 3 levels of phosphorus viz-40, 80, 120 kgha$^{-1}$, 4 levels of zinc sulphate viz-Control, 25, 50, 75 kgha$^{-1}$ and 3 levels of water salinity viz-EC-O, EC-8 and EC-16 dSm$^{-1}$. Erthen pot of 30 Cm diameter size were filed with 8.0 kg soil. The salinity levels of irrigation water were prepared by dissolving $Na_2So4$, NaCl, $CaCl_2$, $CaCl_2$ $MgCl_2$, $Na_2CO_3$ and $NaHCO_3$ in Tub-well water having Ec-2.4 dSm$^{-1}$, $Na^{+}$-14.1, $Mg^{++}$-3.1 and Cl-11.8, HCO3-8.2 and SO4-4 mel. The recommended dosses of N and K@ 120, 60 Kg ha$^{-1}$ respectively were applied as through urea, MOP and Two seedling of rice variety(Saket-4). Crop was irrigated with tub-well water just after transplanting and thereafter irrigation was given with treatment water. After 10 days transplanting crop was thinned to one plant in each pot. The data on plant height and grain yield were recorded and chemical analysis of grain after crop harvest.

## RESULT AND DISCUSSION

A pot experiment was conducted with rice for two consecutive years for drawing valid conclusion data grain yield and nutrients composition values have been statistically analyzed appended in Table-1 and discussed below.

### Effect on grain yield

The grain yield of rice was decreased with enhancing levels of EC in irrigation water. A critical examination of data indicates that each higher level of salinity caused significantly reduction in grain yield of rice as compared to each lower level of salinity during both crop years. Maximum reduction was noted at highest level of $E_2$(16dSm$^{-1}$) and resulted reduction to the extent of 52.30 and 51.65% yield over control (EC-o). The EC of water create an

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ionic imbalance toxic effect which upsets the growth regulatory Mechanism of plants ultimately retards the production, also reported Khandelwal *et al.* (1990). The $P_2$ doses of phasphorus proved beneficial dose for rice in the present set of treatment. The favourable effect of P fertilization is in accordance with Swarup and Yaduvanshi (2000). Reveals (Table-1) that the grain yield of rice increased with application of Zinc sulphate Significantly. The Zn2 level (50 $Kgha^{-1}$) of Zinc Significantly inhanced grain yield over Zn1 (25 $Kgha^{-1}$) and Zno (Contral) levels during both the years of experiments and yield extent to 46.11 and 43.24% over Control to 1st and 2nd years. While the $Zn_3$ (75 $kgha^{-1}$) level decreased grain yield over $Zn_2$ level during both crop sessions. But grain yield of rice was significantly increased with $Zn_3$ over $Zn_1$ and $Zn_0$ levels and also $Zn_1$ increased significantly grain yield over $Zn_0$ level of Zinc sulphate of two year crop sesion. Hence the $Zn_2$ level of Zinc Sulphate proved benificial with respect to grain yield of rice simular resalt was reported Jat and mehra (2007).

**Effect of Nutrient Composition**

It is evident from Table-1 that the Nitrogen contents in grain of rice was increased markedly with enhancing levels of water salinity Irrespective of the treatment the N Content (%) varied from 1.20 to 1.34 (%) and each increasing level of EC water caused significantly enhancement in N content of grain as compared to each lower levels of EC during both years of experiment. The highest N Content was Noted in highest level of EC (EC8-16$Sm^{-1}$). Application of phosphorus and Zinc sulphate in rice crop increased N content. Each higher level of P resulted significant enhancement of N as compared to lower levels of P and the $Zn_3$ (75$kgha^{-1}$) of Zinc. sulphate in creased significantly N content in grain over Zn0 level of Zinc. In case of $Zn_2$ level was at par with $Zn_3$ level of Zinc regard to N content (%) in grain of rice during both year of Study. The Zn1, also increased N content % of grain over $Zn_0$ level two year experiments. The phosphorus declined Markedly with saline irrigation water. The ranged P (%) in grain of rice 0.140 to 0.207 and clearly indicate that each increasing level of EC cussed significant reduction in P content (%) in comperision lower levels of EC water. The $EC_2$ (16 $dSm^{-1}$) level of salinity proved more harmful in case of P content (%) of rice. The p content (%) in grain improved with application of Pdoses. A criticaly examine shows that each increasing level of phosphorus application resulted enhancement of P content (%) in grain of rice both years of experimention. Its fact that inhancing P dosses increased concentration in soil salution with in turn increased root and plant growth and absorption of P by plant simmular beneficial result of P has been noted by Kumar and Verma (1999). It is evedent to Table-1 that Zinc application in rice crop was reduced P content (%). Higher doses of Zinc decreased significantly P content (%) in grain of all two respected years. The data recorded of potassium content (%) clear from Table-1 that the higher level of salinity in irrigation water declined K content and varied from 0.381 to 0.609% affected by water salinity. Maximum reduction was noted in highest level of EC 16$dsm^{-1}$ during two year of the study. An evaluate the data of f P application enhanced K content (%). Each higher levels of P significantly increased K content (%) as compared to lower level of P. It is seen from table-1 that the potassium content was favoared significantly with Zinc application. The $Zn_2$ (50 $kgha^{-1}$) of Zinc sulphate increased. significatly the K content in grain of rice over $Zn_0$, and also $Zn_1$ levels. Among the calcium content in grain of rice was negatively affected with increasing level of salt concentration of irrigation water. Irrespective of the treatments the Ca content (%) in grain of rice renged from 0.233 to 0.332 % respectively. The data indicates that the each increasing levels of EC resulted significantly reduction in Ca content of grain as compared to preceding lower levels of EC irrigation water. In the P application shows the increasing of P enhanced Ca content (%) over lower doses of P throughout the experiment caused due to more development of roots and more nutrient site for absorption of due to application. The Zinc fertilization improved the Ca content(%) in grain of rice Maximum Ca content was noted at highest level of Zinc ($Zn_3$-75$kgha^{-1}$). Each increasing level of Zinc increased significantly Ca content (%) in rice as compared to lower levels of Zinc during both year of treatments. It is clear from table-1 that the sodium content ranged the irrespective of the treatment from 0.140 to 0.260 (%) were increased significantly with higher levels of salinity. The Na content increasment significantly with each high levels of EC in comparison to lower levels. The $EC_2$ [16$dSm^{-1}$] levels proved more beneficial with respect to Na content in rice. Same finding was noted by Lal *et al.* (1999). The Na content (%) significantly increased with decreasing doses of P and Zn as compared to lower levels of P and Zn in grain two years of rice crops. Highest reduction was noted $P_3$ (120 $kgha^{-1}$) and Zn3-75$kgh^{-1}$. These findings are in accordance with those of Sharma 2 Pal (2001). The data indicate (Table-1) that each higher levels of salinity of water and phosphorus doses reduced significantly Zn content(%) in grain of rice. The Zn content (%) varied from 19.217 to 33.139 ppm respect to salinity in 1st & 2d crop season. The date revels that application of Zinc sulphate Markedly affected Zinc content (%) in grain of rice. The $Zn_2$ and $Zn_3$ levels of Zinc enhanced significantly Zn content (%) in grain of rice over $Zn_1$ and $Zn_0$ during both year of study. The $Zn_2$ level of Zinc proved more beneficial with respect to Zinc content of rice.

**Table :** Effect of Phophorus and Zinc on yield and nutrients content (%) of rice crop with water salinity

| Treatment | Grain yield (g pot1 ) | | Nutrients Content (%) | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | N | | P | | K | | Ca | | Na | | Zn (ppm) | |
| | | | I$^{st}$ | II$^{nd}$ | I$^{st}$ | II$^{nd}$ | I$^{st}$ | II$^{nd}$ | I$^{st}$ | II$^{nd}$ | I$^{st}$ | II$^{nd}$ | I$^{st}$ | II$^{nd}$ |
| EC levels | | | | | | | | | | | | | | |
| $E_0$ | 8.31 | 8.58 | 1.21 | 1.26 | 0.20 | 0.20 | 0.60 | 0.60 | 0.33 | 0.31 | 0.14 | 0.14 | 32.95 | 33.13 |
| $E_1$ | 6.21 | 6.42 | 1.26 | 1.25 | 0.17 | 0.17 | 0.53 | 0.51 | 0.27 | 0.27 | 021 | 0.22 | 28.91 | 29.70 |
| $E_2$ | 3.96 | 4.15 | 1.34 | 1.32 | 0.14 | 0.14 | 0.38 | 0.40 | 0.23 | 0.23 | 0.26 | 0.24 | 19.21 | 19.23 |
| C.D. at 5% | 0.0635 | 0.1433 | 0.0135 | 0.0143 | 0.0030 | 0.0028 | 0.0251 | 0.0135 | 0.0091 | 0.0088 | 0.0063 | 0.0107 | 0.5622 | 1.2328 |
| Phosporus Levels | 5.23 | 5.41 | 1.23 | 1.21 | 6.16 | 0.16 | 0.47 | 0.47 | 0.24 | 0.23 | 0.24 | 0.23 | 28.95 | 19.70 |
| $P_1$ | 6.23 | 6.98 | 1.27 | 1.25 | 0.17 | 0.18 | 0.51 | 0.51 | 0.28 | 0.27 | 0.20 | 0.19 | 27.07 | 27.20 |
| $P_2$ | 6.18 | 6.95 | 1.31 | 1.30 | 0.18 | 0.18 | 0.53 | 0.53 | 0.31 | 0.31 | 0.17 | 0.18 | 25.05 | 25.16 |
| $P_3$ | | | | | | | | | | | | | | |
| C.D. at 5% | 0.0635 | 0.1433 | 0.0135 | 0.0143 | 0.0030 | 0.0028 | 0.0251 | 0.0135 | 0.0091 | 0.0088 | 0.0063 | 0.0107 | 0.5622 | 1.2328 |
| Zinc Levels | 4.86 | 5.10 | 1.25 | 1.33 | 0.18 | 0.18 | 0.48 | 0.49 | 0.25 | 0.25 | 0.23 | 0.21 | 25.34 | 25.53 |
| $Zn_0$ | 5.96 | 6.16 | 1.27 | 1.26 | 0.17 | 0.17 | 0.50 | 0.49 | 0.27 | 0.26 | 0.21 | 0.21 | 26.54 | 26.74 |
| $Zn_1$ | 7.11 | 7.31 | 1.29 | 1.27 | 0.17 | 0.17 | 0.51 | 0.51 | 0.28 | 0.28 | 0.19 | 0.19 | 28.23 | 28.22 |
| $Zn_2$ | 6.72 | 6.96 | 1.27 | 1.28 | 0.16 | 0.16 | 0.52 | 0.52 | 0.29 | 0.30 | 0.19 | 0.18 | 27.98 | 28.93 |
| $Zn_3$ | | | | | | | | | | | | | | |
| C. Dat 5% | 0.0733 | 0.1655 | 0.0156 | 0.0165 | 0.0035 | 0.0033 | N.S | 0.0156 | 0.0106 | 0.0102 | 0.0124 | 0.0124 | 0.06491 | 1.4235 |

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