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STUDIES ON PHOSPHORUS NUTRITION THROUGH BAND PLACEMENT AND SEED COATING IN MAIZE

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INTRODUCTION

Maize is the third most important cereal globally, serving as a staple food for many countries. It is vital in Latin America, Sub-Saharan Africa, and Asia, providing food, feed, and biofuel. Despite its potential, maize yields in Pakistan are low due to phosphorus (P) deficiency, a key nutrient required for plant growth. Phosphorus fixation in soils further reduces its availability. Methods like band placement and seed coating can improve phosphorus use efficiency (PUE) and support sustainable maize production. Methodology.

OBJECTIVE

The aim of this research is to boost maize productivity in Pakistan by enhancing phosphorus use efficiency through innovative techniques like band placement (BP) and phosphorus seed coating (SC), ensuring greater nutrient uptake and improved yields.

METHODOLOGY

Experimental Site

The study was conducted at the Agronomic Research Area, University of Agriculture, Faisalabad (31.26° N, 73.06° E, Altitude 184.4 m) during summer 2017.

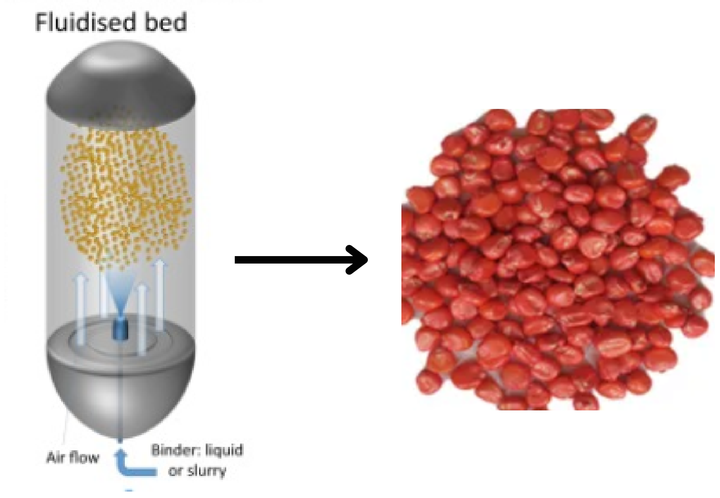
Experimental Design

The experiment followed a randomized complete block design (RCBD) with three replications and a plot size of 3 × 6 m. Eight treatments were tested.

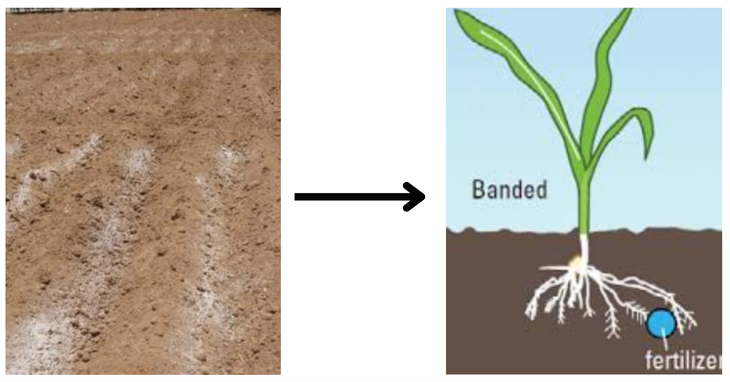
F0: Control
F1: SC with SSP
F2: SC with DAP
F3: BP of SSP
F4: BP of DAP
F5: SP + BP of SSP
F6: SC with SSP + BP of DAP
F7: SC with DAP + BP of SSP
F8: SC with DAP + BP of DAP

Phosphorus (P) was applied at 125 kg ha^{-1} for band placement, while seed coating involved 70 mg/kg of SSP and 60 mg/kg of DAP. Maize hybrid (31R88) was sown on July 27, 2017, with row spacing of 75 cm and plant spacing of 15 cm, maintained through manual thinning. Fertilizers (N: 250 kg ha^{-1}, K: 125 kg ha^{-1}) were applied in three splits (at sowing, knee height, and flowering stages). Soil analysis was conducted before and after the experiment. Standard procedures were followed for collecting growth and yield data. Plant height and cob characteristics (length, number of rows, and grains per cob) were measured from random samples of ten plants and cobs per plot.

SEED COATING



BED PLACEMENT



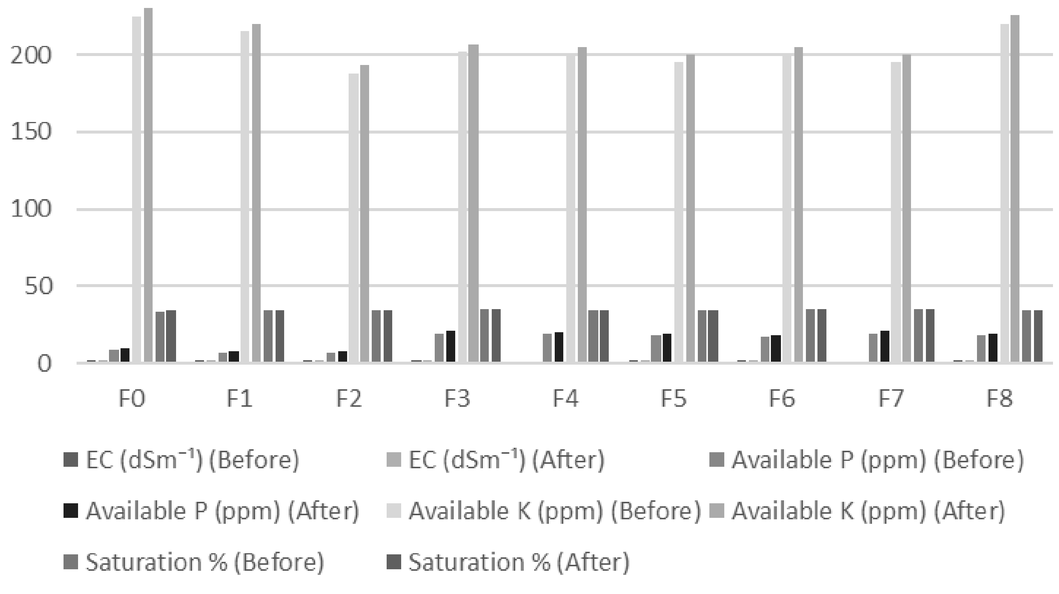
RESULTS

Maximum plant height (230 cm) was recorded in F5 (Seed coating + Band placement of SSP), while the minimum height (190 cm) occurred in F0 (control). F5 also produced the longest cob (18.80 cm), with F7 showing a similar length, and F0 the shortest (12.53 cm). The maximum number of grain rows per cob (15.20) was observed in F5, with F8 following closely, while F0 had the least (12). F5 had the highest grain count per cob (382.9) and 1000-grain weight (260.3 g), while F0 had the lowest values in both categories (292.1 grains and 197.7 g, respectively). Grain yield was highest in F5 (7.72 t ha^{-1}) and lowest in F0 (3.92 t ha^{-1}). Similarly, F5 showed the highest biological yield (19.33 t ha^{-1}), with F0 having the lowest (12.66 t ha^{-1}). The highest harvest index (39.96%) was recorded in F5, while F0 had the lowest (31.10%).

Effect of P nutrition through band placement and seed coating on growth, yield and yield components of maize

Treatments	Plant Height (cm)	Cob Length (cm)	No. of rows per cob	No. of grains per cob	1000-grain weight (g)	Grain yield (t ha^{-1})	Biological yield (t ha^{-1})	Harvest index (%)
F_0	190.7 d	12.53 f	12.00 f	292.1 d	197.7 e	3.92 e	12.66 e	31.10 d
F_1	209.4 bc	16.40 de	13.06 de	316.0 c	216.7 de	5.07 d	15.29 d	33.20 cd
F_2	206.6 c	15.90 e	12.66 ef	308.9 cd	208.3 e	4.87 d	14.27 d	34.10bcd
F_3	213.1 bc	17.06 cd	13.73 cd	358.0 b	236.0bcd	6.79 c	17.66 bc	38.53 a
F_4	214.4 bc	17.06 cd	13.46 cde	355.6 b	232.0 cd	6.39 c	17.02 c	37.56 ab
F_5	230.0 a	18.80 a	15.20 a	382.9 a	260.3 a	7.72 a	19.33 a	39.96 a
F_6	221.1 abc	17.40 bc	13.86 bcd	359.4 b	236.7bcd	6.90 bc	18.96 ab	36.63 abc
F_7	224.0 ab	18.16 ab	14.13 bc	366.6ab	253.7ab	7.40 ab	18.59 ab	39.90 a
F_8	217.3 abc	17.50 bc	14.80 ab	361.7ab	237.3bc	6.96 bc	18.78 ab	37.13abc
LSD Value	15.06	0.99	1.02	22.52	20.25	0.60	1.45	4.24

Post-harvest results showed notable improvements in soil chemical properties. Available phosphorus increased across all treatments, especially in F_3 (Band placement of SSP), from 19.5 ppm to 20.7 ppm. Potassium levels also rose, with F_8 (Seed coating + Band placement of DAP) reaching the highest value at 226 ppm. pH remained stable, while slight increases in EC were observed, indicating enhanced nutrient availability.



CONSLUSION

- Phosphorus application methods like seed coating and band placement significantly improved maize growth, yield, and efficiency.
- The F5 treatment (SSP + Band placement of SSP) consistently showed the highest plant height, grain count, and yield compared to other treatments.
- Efficient phosphorus use in maize is essential for enhancing productivity, especially in regions with P-deficient soils, like Pakistan.

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