

## EFFECT OF FERTILISER PHOSPHORUS, FYM AND INCUBATION PERIOD ON AVAILABLE P IN DIFFERENT SOIL TYPES OF RANGA REDDY DISTRICT OF ANDHRA PRADESH

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### ABSTRACT

A laboratory experiment was carried out at Central Research Institute for Dry land Agriculture Hyderabad during the year 1994 to evaluate the releasing pattern and availability of phosphorus from different soil types of Ranga Reddy district of Andhra Pradesh. The results revealed that increasing levels of FYM and applied P increased the available P in all types of soils. The phosphorus availability was increased at 30 days of incubation as compared to 15 days with FYM, whereas, without FYM it increased with the increase in the incubation.

**KEY WORDS:** FYM, Fertiliser phosphorus, Incubation, Phosphorus availability

Phosphorus is one of the essential elements for the growth of crops. The problem of availability of phosphorus is due to its retention in soil. It is estimated that about 98 per cent of Indian soils contain insufficient amounts of available P as it gets easily fixed with Iron and Aluminium oxides and calcite minerals and form insoluble complexes (Dhawan *et al.*, 1966). Therefore, it is essential to ameliorate the condition to increase the availability of phosphorus to crops. The addition of organic matter along with phosphatic fertilisers has been found to increase the availability of applied as well as native phosphorus (Subramanian and Gopalaswamy, 1991). The literature is rather scanty with respect to effect of FYM, levels of phosphorus and incubation period on available P content of Ranga Reddy district of Andhra Pradesh. Keeping these points in view, the present investigation was carried out.

### MATERIALS AND METHODS

A laboratory experiment was conducted at Central Research Institute for Dryland Agriculture, Hyderabad during the year 1994 on six major soil types of Ranga Reddy district of Andhra Pradesh. The soil samples were drawn from a depth of 30 cm. Two hundred grams of air dried, sieved soils were properly levelled and placed in petri dishes. Some basic physico - chemical characteristics of the experimental soils are given in Table 1.

The study was conducted in a completely randomised design. The treatments included six soil types, three levels of FYM (0, 10 and 20 t ha<sup>-1</sup>) and four levels of phosphorus (0, 10, 20 and 30 ppm) mixed with the soils. The total P<sub>2</sub>O<sub>5</sub> content of FYM was 0.035 per cent. Different amounts of phosphorus were added through KH<sub>2</sub>PO<sub>4</sub> salt solution and well decomposed FYM was added as per treatment. All treatments were replicated three times. After imposing different treatments the soils were incubated at room temperature (35°C) and moisture content was kept near field capacity. The loss in weight was compensated by periodical weighing and adding required amount of water. The samples were drawn at 15 days interval upto 60 days for the estimation of available phosphorus from incubated soil samples. The available P was determined by Olsen's method (Olsen *et al.*, 1954).

### RESULTS AND DISCUSSION

#### Effect of FYM on available P

It is quite evident from the Table 2 that increase in available phosphorus was observed when the level of FYM was increased from 0 to 20 tonnes ha<sup>-1</sup>. The increase in available phosphorus was 30.1 and 66.6 per cent with 10 and 20 t ha<sup>-1</sup> FYM respectively over no FYM application. The average available phosphorus was maximum in Muzarabat soil (19.75 ppm) and the minimum of 14.18 ppm in Lamjoli soil. The interaction effect of FYM and soil types revealed that maximum available phosphorus (24.81 ppm) was in Muzarabat soil

**Table 1.** Physico - Chemical properties of the experimental soil

| Properties                                    | Loyapally | Lamjoli | Muzarabat | Moheemthorai | Rajendranagar | Secundrabad |
|---|-----------|---------|-----------|--------------|---------------|-------------|
| Particle size distribution (%)                |           |         |           |              |               |             |
| Coarse sand                                   | 12.8      | 10.4    | 11.4      | 14.7         | 2.3           | 5.0         |
| Fine sand                                     | 40.2      | 71.0    | 74.2      | 66.7         | 33.1          | 34.4        |
| Silt  | 19.9      | 7.3     | 5.0       | 8.0          | 20.0          | 26.2        |
| Clay  | 25.2      | 8.6     | 8.3       | 8.9          | 43.8          | 33.0        |
| pH  | 8.2       | 8.6     | 8.1       | 8.3          | 7.6           | 8.0         |
| EC (dSm <sup>-1</sup> )                       | 0.52      | 0.84    | 1.32      | 0.52         | 0.41          | 1.02        |
| CaCO <sub>3</sub> (%)                         | 2.84      | 5.6     | 0.84      | 3.14         | 3.91          | 4.64        |
| Available P <sub>2</sub> O <sub>5</sub> (ppm) | 7.84      | 5.21    | 4.24      | 5.0          | 8.32          | 9.20        |

under 20 t ha<sup>-1</sup> of FYM application and minimum 7.42 ppm in Lamjoli soil where FYM was not applied. This increase in available P may be due to chelating effect of organic matter. Singh and Ram (1977) reported that organic matter lowered the fixation of Al - P and Fe - P in soil.

#### Effect of applied phosphorus on available P

Different soil types and different levels of added phosphorus had significant effect on available phosphorus (Table 4). Highly significant increase in available phosphorus with increase in the applied phosphorus levels was observed. The increase was 34.6, 72.7 and 101.9 per cent over control at 10, 20 and 30 ppm of applied P respectively. Considering the soil types, the mean value of available phosphorus was maximum (19.84 ppm) in Muzarabat soil followed by Loyapally soil (19.04 ppm). Differences in available phosphorus in different types of soil might have been due to variation in the textural composition of different soils. This is also

**Table 2.** Effect of FYM on the available phosphorus content (ppm) in different soils

| Soil types    | FYM (tonnes ha <sup>-1</sup> ) |       |       |       |
|---------------|--------------------------------|-------|-------|-------|
|               | 0                              | 10    | 20    | Mean  |
| Loyapally     | 14.12                          | 18.21 | 24.62 | 18.98 |
| Lamjoli       | 7.42                           | 15.83 | 19.81 | 14.18 |
| Muzarabat     | 14.62                          | 19.82 | 24.81 | 19.75 |
| Moheemthorai  | 11.82                          | 15.74 | 20.12 | 15.89 |
| Rajendranagar | 16.84                          | 16.92 | 22.82 | 18.86 |
| Secundrabad   | 13.42                          | 15.84 | 18.12 | 15.79 |
| Mean          | 13.04                          | 16.97 | 21.72 |       |

C.D (P=0.05)

FYM level 0.22

Soil types 0.31

Interaction 0.53

**Table 3.** Effect of FYM and length of incubation period on available P content (ppm)

| Incubation period (days) | FYM (tonnes ha <sup>-1</sup> ) |       |       | Mean  |
|--------------------------|--------------------------------|-------|-------|-------|
|                          | 0                              | 10    | 20    |       |
| 15                       | 14.82                          | 17.42 | 20.82 | 17.69 |
| 30                       | 13.64                          | 20.62 | 26.11 | 20.12 |
| 45                       | 12.12                          | 16.42 | 22.14 | 16.89 |
| 60                       | 10.72                          | 13.81 | 17.48 | 14.00 |
| Mean                     | 12.83                          | 17.07 | 21.64 |       |

C.D (p 0.05)

FYM level 0.22

Incubation 0.25

Interaction 0.25

confirmed by findings of Kamath and Subbiah (1971).

#### Effect of phosphorus levels and incubation period on available P

A perusal of data showed an increase in available P upto 30 days of incubation (20.08 ppm). Thereafter, it was found to decline with an

**Table 4.** Effect of FYM on the available phosphorus content (ppm) under different soils.

| Soil types    | Phosphorus levels (ppm) |       |       |       |       |
|---------------|-------------------------|-------|-------|-------|-------|
|               | 0                       | 10    | 20    | 30    | Mean  |
| Loyapally     | 12.31                   | 16.41 | 22.46 | 25.01 | 19.04 |
| Lamjoli       | 9.62                    | 12.51 | 15.46 | 19.41 | 14.25 |
| Muzarabat     | 12.84                   | 18.46 | 21.92 | 26.12 | 19.84 |
| Moheemthorai  | 9.91                    | 14.54 | 17.81 | 21.14 | 15.85 |
| Rajendranagar | 11.64                   | 15.68 | 22.04 | 25.12 | 18.62 |
| Secundrabad   | 11.54                   | 13.69 | 17.51 | 20.22 | 15.74 |
| Mean          | 11.31                   | 15.22 | 19.53 | 22.83 |       |

C.D (P=0.05)

Types of soil 0.31

Phosphorus 0.25

**Table 5.** Effect of phosphorus and length of incubation period on available P content (ppm)

| Incubation period (days) | Phosphorus levels (ppm) |       |       |       | Mean  |
|--------------------------|-------------------------|-------|-------|-------|-------|
|                          | 0                       | 10    | 20    | 30    |       |
| 15                       | 9.77                    | 15.64 | 20.81 | 24.46 | 17.67 |
| 30                       | 13.52                   | 17.91 | 22.76 | 26.14 | 20.08 |
| 45                       | 11.86                   | 14.84 | 19.09 | 22.04 | 16.96 |
| 60                       | 9.87                    | 12.64 | 15.54 | 18.46 | 14.13 |
| Mean                     | 11.26                   | 15.26 | 19.55 | 22.78 |       |

CD (P=0.05)

|             |      |
|-------------|------|
| Phosphorus  | 0.25 |
| Incubation  | 0.25 |
| Interaction | 0.50 |

**Table 6.** Effect of incubation period on available P content (ppm)

| Incubation period (days) | Loyapally | Lamjoli | Muzarabat | Moheemthorai | Rajendranagar | Secundrabad | Mean  |
|--------------------------|-----------|---------|-----------|--------------|---------------|-------------|-------|
| 15                       | 21.92     | 10.61   | 17.14     | 16.14        | 19.84         | 19.36       | 17.50 |
| 30                       | 20.01     | 16.85   | 25.84     | 19.12        | 20.64         | 15.42       | 19.93 |
| 45                       | 18.00     | 15.02   | 19.78     | 14.64        | 18.52         | 14.32       | 16.61 |
| 60                       | 15.21     | 13.64   | 14.53     | 12.34        | 14.86         | 12.38       | 13.82 |
| Mean                     | 18.79     | 14.03   | 19.32     | 15.74        | 18.47         | 15.62       |       |

increase in incubation period. The available phosphorus differed significantly at different levels of applied P. The interaction effect of applied phosphorus and incubation period was also statistically significant. Observation on the combined effect of phosphorus levels and incubation period, maximum amount of available phosphorus (26.14 ppm) was obtained when 30 ppm of phosphorus was applied and incubated for 30 days. Generally dose of phosphorus depends upon the phosphorus fixing capacity of soil and water solubility of phosphatic fertiliser. Higher the fixation capacity of the soil lower is the increase in the amount of available phosphorus with the increase in fertilizer dose (Gupta *et al.*, 1971 and Srivastava and Pathak, 1972).

#### Effect of incubation periods on available P.

The data depicted in Table 3 revealed significant differences in available P for the incubation period. Increase in available P was observed upto 30 days of incubation and there after a declining trend was noticed. A period of 30 days at which maximum P was available might be related with decomposition of applied FYM. Considering the effect on individual soil, the available P was increased upto 30 days in Lamjoli, Muzarabat, Moheemthorai and Rajendranagar

soils, where as, the Loyapally and Secundrabad soils available P consistently decreased as the incubation period was increased from 15 to 30 days (Table 6). Maximum available phosphorus in Muzarabat soil is due to least amount of CaCO<sub>3</sub> and clay content. Akbar *et al.*, (1981) reported that higher clay contents give high phosphorus fixation and therefore Muzarabat soil having least clay content showed highest available phosphorus.

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