**Effect of PSRB with various Phosphorus sources on soil pH at growth stages of Black gram.**

|  |  |  |  |
| --- | --- | --- | --- |
| Treatments | Flowering stage | Pod formation stage | Maturity stage |
| Phosphorus sources | | | |
| P0 (Control) | 7.33 | 7.30 | 7.23 |
| P1 (Bone Meal ) | 7.31 | 7.29 | 7.21 |
| P2 (Rock Phosphate) | 7.29 | 7.26 | 7.20 |
| P3 (KH2PO4) | 7.25 | 7.23 | 7.18 |
| P4 (TCP) | 7.28 | 7.25 | 7.16 |
| P5 (DAP) | 7.18 | 7.15 | 7.09 |
| P6 (MCP) | 7.2 | 7.17 | 7.16 |
| SEm(±) | 0.12 | 0.12 | 0.11 |
| CD at 5% | NS | NS | NS |
| PSB consortium | | | |
| B0 (Control) | 7.34 | 7.31 | 7.25 |
| B1 (Consortium 1) | 7.21 | 7.18 | 7.12 |
| B2 (consortium 2) | 7.24 | 7.22 | 7.16 |
| SEm(±) | 0.07 | 0.07 | 0.07 |
| CD at 5% | NS | NS | NS |
| F probability test | | | |
| P | NS | NS | NS |
| B | NS | NS | NS |
| P×B (CD at 5%) | NS | NS | NS |

**Effect of PSRB with various Phosphorus sources on soil organic C (g kg-1 ) at growth stages of Black gram.**

|  |  |  |  |
| --- | --- | --- | --- |
| Treatments | Flowering stage  (g kg-1 ) | Pod formation stage  (g kg-1 ) | Maturity stage  (g kg-1 ) |
| Phosphorus sources | | | |
| P0 (Control) | 4.27 | 4.24 | 4.25 |
| P1 (Bone Meal ) | 4.43 | 4.41 | 4.43 |
| P2 (Rock Phosphate) | 4.95 | 4.96 | 5.00 |
| P3 (KH2PO4) | 4.76 | 5.75 | 4.80 |
| P4 (TCP) | 4.80 | 4.80 | 4.89 |
| P5 (DAP) | 4.99 | 5.01 | 5.07 |
| P6 (MCP) | 4.88 | 4.59 | 4.68 |
| SEm(±) | 0.07 | 0.08 | 0.08 |
| CD at 5% | 0.22 | 0.23 | 0.24 |
| PSB consortium | | | |
| B0 (Control) | 4.57 | 4.57 | 4.59 |
| B1 (Consortium 1) | 4.75 | 4.75 | 4.83 |
| B2 (consortium 2) | 4.85 | 5.15 | 4.77 |
| SEm(±) | 0.05 | 0.05 | 0.05 |
| CD at 5% | 0.56 | 0.57 | 0.61 |
| F probability test | | | |
| P | S | S | S |
| B | S | S | S |
| P×B (CD at 5%) | 1.48 | 1.53 | 1.64 |

**Effect of PSRB with various Phosphorus sources on soil available N (mg kg-1) at growth stages of Black gram.**

|  |  |  |  |
| --- | --- | --- | --- |
| Treatments | Flowering stage  (mg kg-1) | Pod formation stage (mg kg-1) | Maturity stage  (mg kg-1) |
| Phosphorus sources | | | |
| P0 (Control) | 76.60 | 77.04 | 76.50 |
| P1 (Bone Meal ) | 80.03 | 81.20 | 80.07 |
| P2 (Rock Phosphate) | 92.56 | 93.43 | 92.86 |
| P3 (KH2PO4) | 83.60 | 84.45 | 83.64 |
| P4 (TCP) | 87.54 | 88.68 | 87.92 |
| P5 (DAP) | 96.67 | 97.89 | 96.87 |
| P6 (MCP) | 80.46 | 81.66 | 80.79 |
| SEm(±) | 1.23 | 1.26 | 1.24 |
| CD at 5% | 3.52 | 3.62 | 3.56 |
| PSB consortium | | | |
| B0 (Control) | 82.47 | 83.42 | 82.63 |
| B1 (Consortium 1) | 87.39 | 88.53 | 87.64 |
| B2 (consortium 2) | 86.20 | 87.06 | 86.30 |
| SEm(±) | 0.80 | 0.83 | 0.81 |
| CD at 5% | 8.80 | 9.04 | 8.90 |
| F probability test | | | |
| P | S | S | S |
| B | S | S | S |
| P×B (CD at 5%) | 23.29 | 23.93 | 23.55 |

**Effect of PSRB with various Phosphorus sources on soil available P (mg kg-1) at growth stages of Black gram.**

|  |  |  |  |
| --- | --- | --- | --- |
| Treatments | Flowering stage  (mg kg-1) | Pod formation stage (mg kg-1) | Maturity stage  (mg kg-1) |
| Phosphorus sources | | | |
| P0 (Control) | 8.79 | 9.96 | 9.39 |
| P1 (Bone Meal ) | 10.96 | 11.98 | 11.34 |
| P2 (Rock Phosphate) | 16.61 | 17.96 | 17.29 |
| P3 (KH2PO4) | 15.45 | 16.31 | 15.68 |
| P4 (TCP) | 15.41 | 16.94 | 16.1 |
| P5 (DAP) | 17.45 | 18.95 | 18.05 |
| P6 (MCP) | 13.25 | 15.12 | 14.17 |
| SEm(±) | 0.23 | 0.26 | 0.24 |
| CD at 5% | 0.68 | 0.74 | 0.70 |
| PSB consortium | | | |
| B0 (Control) | 13.07 | 14.47 | 13.69 |
| B1 (Consortium 1) | 14.61 | 15.98 | 15.13 |
| B2 (consortium 2) | 14.28 | 15.50 | 14.89 |
| SEm(±) | 0.15 | 0.17 | 0.16 |
| CD at 5% | 1.70 | 1.85 | 1.76 |
| F probability test | | | |
| P | S | S | S |
| B | S | S | S |
| P×B (CD at 5%) | 4.50 | 4.91 | 4.68 |

**Effect of PSRB with various Phosphorus sources on soil available K (mg kg-1) at growth stages of Black gram.**

|  |  |  |  |
| --- | --- | --- | --- |
| Treatments | Flowering stage  (mg kg-1) | Pod formation stage (mg kg-1) | Maturity stage  (mg kg-1) |
| Phosphorus sources | | | |
| P0 (Control) | 76.52 | 78.52 | 77.84 |
| P1 (Bone Meal ) | 79.72 | 81.65 | 80.75 |
| P2 (Rock Phosphate) | 92.52 | 94.56 | 93.96 |
| P3 (KH2PO4) | 87.44 | 89.43 | 88.60 |
| P4 (TCP) | 89.18 | 90.85 | 89.72 |
| P5 (DAP) | 95.26 | 97.10 | 96.13 |
| P6 (MCP) | 83.37 | 85.51 | 84.38 |
| SEm(±) | 1.25 | 1.24 | 1.22 |
| CD at 5% | 3.57 | 3.54 | 3.50 |
| PSB consortium | | | |
| B0 (Control) | 84.26 | 86.17 | 85.39 |
| B1 (Consortium 1) | 87.56 | 89.61 | 88.98 |
| B2 (consortium 2) | 87.05 | 88.92 | 87.65 |
| SEm(±) | 0.82 | 0.81 | 0.80 |
| CD at 5% | 8.93 | 8.84 | 8.75 |
| F probability test | | | |
| P | S | S | S |
| B | S | S | S |
| P×B (CD at 5%) | 23.65 | 23.39 | 23.16 |

**Effect of PSRB with various Phosphorus sources on microbial biomass carbon (µg-1soil) status**  **at growth stages of Black gram.**

|  |  |  |  |
| --- | --- | --- | --- |
| Treatments | Flowering stage  (µg-1soil) | Pod formation stage (µg-1soil) | Maturity stage  (µg-1soil) |
| Phosphorus sources | | | |
| P0 (Control) | 84.82 | 86.47 | 85.91 |
| P1 (Bone Meal ) | 85.29 | 88.44 | 87.16 |
| P2 (Rock Phosphate) | 99.41 | 102.10 | 98.86 |
| P3 (KH2PO4) | 95.54 | 97.32 | 96.06 |
| P4 (TCP) | 97.06 | 99.69 | 97.36 |
| P5 (DAP) | 100.39 | 103.52 | 98.90 |
| P6 (MCP) | 91.38 | 93.08 | 93.07 |
| SEm(±) | 1.53 | 1.29 | 2.36 |
| CD at 5% | 4.38 | 3.70 | 6.75 |
| PSB consortium | | | |
| B0 (Control) | 90.96 | 93.55 | 91.03 |
| B1 (Consortium 1) | 94.53 | 97.23 | 97.12 |
| B2 (consortium 2) | 94.75 | 96.63 | 96.13 |
| SEm(±) | 1.00 | 0.85 | 1.54 |
| CD at 5% | 10.95 | 9.26 | 16.87 |
| F probability test | | | |
| P | S | S | S |
| B | S | S | S |
| P×B (CD at 5%) | 28.99 | 24.51 | 44.63 |

**Effect of PSRB with various Phosphorus sources on soil phosphatase activity**

**(µg- PNP g-1soil hr -1)**  **at growth stages of Black gram.**

|  |  |  |  |
| --- | --- | --- | --- |
| Treatments | Flowering stage  (µg- PNP g-1soil hr -1) | Pod formation stage (µg- PNP g-1soil hr -1) | Maturity stage  (µg- PNP g-1soil hr -1) |
| Phosphorus sources | | | |
| P0 (Control) | 40.32 | 41.14 | 40.62 |
| P1 (Bone Meal ) | 46.63 | 43.18 | 39.5 |
| P2 (Rock Phosphate) | 50.53 | 70.05 | 66.08 |
| P3 (KH2PO4) | 49.32 | 55.05 | 51.61 |
| P4 (TCP) | 50.56 | 69.87 | 65.94 |
| P5 (DAP) | 51.53 | 81.47 | 77.55 |
| P6 (MCP) | 47.98 | 48.24 | 44.83 |
| SEm(±) | 0.84 | 1.00 | 0.94 |
| CD at 5% | 2.40 | 2.86 | 2.69 |
| PSB consortium | | | |
| B0 (Control) | 47.68 | 52.88 | 49.57 |
| B1 (Consortium 1) | 49.43 | 61.12 | 57.77 |
| B2 (consortium 2) | 49.41 | 59.74 | 56.42 |
| SEm(±) | 0.55 | 0.65 | 0.61 |
| CD at 5% | NS | 7.14 | 6.74 |
| F probability test | | | |
| P | S | S | S |
| B | S | S | S |
| P×B (CD at 5%) | NS | S | S |

**Effect of PSRB with various Phosphorus sources on P fractions(mg kg -1) in soil and phytic acid in seed**

**at harvest.**

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| Treatments | Ca-P  (mg kg -1) | Al-P  (mg kg -1) | Fe-P  (mg kg -1) | Labile P  (mg kg -1) | Phytic acid  (mg g-1 sample) |
| Phosphorus sources | | | | |  |
| P0 (Control) | 174.09 | 42.66 | 79.96 | 47.31 | 5.61 |
| P1 (Bone Meal ) | 180.04 | 43.12 | 80.4 | 46.71 | 5.24 |
| P2 (Rock Phosphate) | 185.80 | 44.96 | 83.17 | 47.36 | 4.23 |
| P3 (KH2PO4) | 184.38 | 44.32 | 82.60 | 47.13 | 4.45 |
| P4 (TCP) | 184.48 | 44.61 | 82.60 | 47.29 | 4.38 |
| P5 (DAP) | 188.97 | 45.72 | 83.65 | 47.43 | 4.12 |
| P6 (MCP) | 182.50 | 43.57 | 81.27 | 46.95 | 4.78 |
| SEm(±) | 2.19 | 0.71 | 1.36 | 0.78 | 0.06 |
| CD at 5% | 6.27 | NS | NS | NS | 0.19 |
| PSB consortium | | | | |  |
| B0 (Control) | 180.93 | 44.76 | 82.49 | 47.22 | 4.79 |
| B1 (Consortium 1) | 185.97 | 43.72 | 81.74 | 47.12 | 4.58 |
| B2 (consortium 2) | 181.78 | 43.94 | 81.61 | 47.16 | 4.68 |
| SEm(±) | 1.43 | 0.46 | 0.89 | 0.51 | 0.04 |
| CD at 5% | 15.67 | NS | NS | NS | 0.49 |
| F probability test | | | | |  |
| P | S | NS | NS | NS | S |
| B | S | NS | NS | NS | S |
| P×B (CD at 5%) | 41.47 | NS | NS | NS | 1.31 |

**Effect of PSRB with various Phosphorus sources on yield attributes of Black gram**

**at harvest.**

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| Treatments | Plant height  (cm) | Root length (cm) | Dry matter  (gm plant-1 ) | No. of pods plant -1 | Yield  (gm pot-1) |
| Phosphorus sources | | | | | |
| P0 (Control) | 30.33 | 27.68 | 29.83 | 18.24 | 18.05 |
| P1 (Bone Meal ) | 31.08 | 28.89 | 33.33 | 18.87 | 20.76 |
| P2 (Rock Phosphate) | 32.77 | 31.39 | 43.25 | 22.16 | 25.47 |
| P3 (KH2PO4) | 32.10 | 31.05 | 38.98 | 20.88 | 23.98 |
| P4 (TCP) | 32.18 | 31.32 | 40.87 | 21.09 | 24.52 |
| P5 (DAP) | 32.90 | 31.73 | 44.03 | 23.00 | 25.60 |
| P6 (MCP) | 31.49 | 30.22 | 36.08 | 19.62 | 22.55 |
| SEm(±) | 0.62 | 0.45 | 0.61 | 0.29 | 0.34 |
| CD at 5% | NS | 1.30 | 1.75 | 0.83 | 0.98 |
| PSB consortium | | | | | |
| B0 (Control) | 31.46 | 29.64 | 36.89 | 20.06 | 22.46 |
| B1 (Consortium 1) | 32.12 | 30.88 | 38.97 | 20.92 | 24.12 |
| B2 (consortium 2) | 31.93 | 30.46 | 38.30 | 20.67 | 23.67 |
| SEm(±) | 0.41 | 0.29 | 0.40 | 0.19 | 0.22 |
| CD at 5% | NS | 3.24 | 4.37 | 2.08 | 2.45 |
| F probability test | | | | | |
| P | NS | S | S | S | S |
| B | NS | S | S | S | S |
| P×B (CD at 5%) | NS | 8.59 | 11.56 | 5.52 | 6.48 |

**Effect of PSRB with various Phosphorus sources on N ,P, K content (%)of Black gram**

**at harvest.**

|  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- |
| Treatments | | P content in grain  (%) | P content in straw  (%) | Total P uptake  (gm pot -1) |  |  |  |
| Phosphorus sources | | | | | |  |  |
| P0 (Control) | | 0.28 | 0.23 | 0.11 |  |  |  |
| P1 (Bone Meal ) | | 0.29 | 0.24 | 0.13 |  |  |  |
| P2(Rock Phosphate) | | 0.34 | 0.26 | 0.17 |  |  |  |
| P3 (KH2PO4) | | 0.32 | 0.25 | 0.16 |  |  |  |
| P4 (TCP) | | 0.33 | 0.25 | 0.16 |  |  |  |
| P5 (DAP) | | 0.35 | 0.26 | 0.18 |  |  |  |
| P6 (MCP) | | 0.31 | 0.25 | 0.15 |  |  |  |
| SEm(±) | | 0.01 | 0.02 | 0.02 |  |  |  |
| CD at 5% | | 0.01 | 0.01 | 0.02 |  |  |  |
| PSB consortium | | | | | |  |  |
| B0 (Control) | 0.31 | | 0.24 | 0.14 |  |  |  |
| B1 (Consortium 1) | 0.32 | | 0.25 | 0.16 |  |  |  |
| B2 (consortium 2) | 0.32 | | 0.25 | 0.15 |  |  |  |
| SEm(±) | 0.01 | | 0.02 | 0.01 |  |  |  |
| CD at 5% | 0.03 | | 0.02 | 0.05 |  |  |  |
| F probability test | | | | | |  |  |
| P | S | | S | S |  |  |  |
| B | S | | S | S |  |  |  |
| P×B (CD at 5%) | 0.08 | | 0.07 | 0.13 |  |  |  |

**Effect of PSRB with various Phosphorus sources on soil dehydrogenase activity**

**(µg-TPFg-1soil hr-1) at growth stages of Black gram.**

|  |  |  |  |
| --- | --- | --- | --- |
| Treatments | Germination stage  (µg-TPFg-1soil hr-1) | Flowering stage  (µg-TPFg-1soil hr-1) | Maturity stage  (µg-TPFg-1soil hr-1) |
| Phosphorus sources | | | |
| P0 (Control) | 45.72 | 46.87 | 46.02 |
| P1 (Bone Meal ) | 46.04 | 47.32 | 46.66 |
| P2 (Rock Phosphate) | 50.19 | 50.96 | 48.44 |
| P3 (KH2PO4) | 49.57 | 50.17 | 48.01 |
| P4 (TCP) | 50.18 | 51.15 | 50.66 |
| P5 (DAP) | 50.57 | 52.50 | 50.96 |
| P6 (MCP) | 48.44 | 49.08 | 48.87 |
| SEm(±) | 0.71 | 0.65 | 0.78 |
| CD at 5% | 2.03 | 1.86 | NS |
| PSB consortium | | | |
| B0 (Control) | 47.43 | 48.39 | 46.84 |
| B1 (Consortium 1) | 49.07 | 50.37 | 48.67 |
| B2 (consortium 2) | 49.52 | 49.98 | 47.95 |
| SEm(±) | 0.46 | 0.42 | 0.51 |
| CD at 5% | 5.08 | 4.64 | 5.60 |
| F probability test | | | |
| P | S | S | NS |
| B | S | S | S |
| P×B (CD at 5%) | 13.45 | 12.29 | NS |

**Effect of PSRB with various Phosphorus sources on soil cation exchange capacity**

**(c mol kg -1) at growth stages of Black gram.**

|  |  |  |  |
| --- | --- | --- | --- |
| Treatments | Flowering stage  (c mol kg -1) | Pod formation stage  (c mol kg -1) | Maturity stage  (c mol kg -1) |
| Phosphorus sources | | | |
| P0 (Control) | 17.86 | 17.86 | 17.75 |
| P1 (Bone Meal ) | 17.86 | 18.03 | 17.99 |
| P2 (Rock Phosphate) | 20.23 | 20.38 | 20.35 |
| P3 (KH2PO4) | 19.38 | 19.51 | 19.44 |
| P4 (TCP) | 19.77 | 19.92 | 19.83 |
| P5 (DAP) | 20.66 | 20.76 | 20.69 |
| P6 (MCP) | 18.65 | 18.80 | 18.72 |
| SEm(±) | 0.27 | 0.27 | 0.27 |
| CD at 5% | 0.77 | 0.79 | 0.77 |
| PSB consortium | | | |
| B0 (Control) | 18.82 | 18.89 | 18.80 |
| B1 (Consortium 1) | 19.44 | 19.58 | 19.53 |
| B2 (consortium 2) | 19.35 | 19.49 | 19.43 |
| SEm(±) | 0.178 | 0.18 | 0.17 |
| CD at 5% | 1.94 | 1.98 | 1.94 |
| F probability test | | | |
| P | S | S | S |
| B | S | S | S |
| P×B (CD at 5%) | 5.15 | 5.24 | 5.14 |

|  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- |
| Treatments | | N content in seed  (%) | N content in stover  (%) | Total N uptake  (gm pot -1) | K content in grain  (%) | K content in straw  (%) | Total K uptake  (gm pot -1) |
| Phosphorus sources | | | | | |  |  |
| P0 (Control) | | 2.68 | 0.79 | 0.69 | 0.61 | 1.32 | 0.51 |
| P1 (Bone Meal ) | | 2.74 | 0.90 | 0.82 | 0.62 | 1.36 | 0.59 |
| P2(Rock Phosphate) | | 3.16 | 1.15 | 1.03 | 0.65 | 1.45 | 0.70 |
| P3 (KH2PO4) | | 3.02 | 1.07 | 0.97 | 0.63 | 1.40 | 0.66 |
| P4 (TCP) | | 3.04 | 1.09 | 1.01 | 0.64 | 1.43 | 0.67 |
| P5 (DAP) | | 3.21 | 1.19 | 1.03 | 0.65 | 1.48 | 0.73 |
| P6 (MCP) | | 2.93 | 1.00 | 0.92 | 0.62 | 1.37 | 0.62 |
| SEm(±) | | 0.04 | 0.01 | 0.04 | 0.01 | 0.02 | 0.02 |
| CD at 5% | | 0.12 | 0.04 | 0.12 | 0.02 | 0.06 | 0.05 |
| PSB consortium | | | | | | | |
| B0 (Control) | 2.90 | | 0.99 | 0.86 | 0.62 | 1.37 | 0.61 |
| B1 (Consortium 1) | 3.01 | | 1.05 | 0.98 | 0.64 | 1.42 | 0.67 |
| B2 (consortium 2) | 3.00 | | 1.03 | 0.94 | 0.63 | 1.42 | 0.64 |
| SEm(±) | 0.02 | | 0.01 | 0.02 | 0.01 | 0.01 | 0.01 |
| CD at 5% | 0.30 | | 0.10 | 0.30 | 0.05 | 0.15 | 0.14 |
| F probability test | | | | | | | |
| P | S | | S | S | S | S | S |
| B | S | | S | S | S | S | S |
| P×B (CD at 5%) | 0.79 | | 0.28 | 0.80 | 0.14 | 0.40 | 0.37 |