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| **Table 5** Impact of activated biochar amendment in soil on three maize hybrids plant height, leaf area at vegetative, tasseling, and maturity stage and grain fresh weight and grain dry weight at maturity stage under FI, PDI, and SDI. |
| **Treatment** | **Plant height (cm)** | **Leaf area (cm)** | **Grain fresh Wt (g)** | **Grain dry Wt (g)** |
| **Vegetative stage**  | **Tasseling stage**  | **Maturity**  | **Vegetative stage**  | **Tasseling stage**  | **Maturity** | **Maturity** | **Maturity** |
| V1A0F1 | 96.4±1.09 mn | 253.5±1.11 ij | 298.5±1.45 b | 131.5±1.77 s | 367.7±11.7 1j | 877.9± 1.6 fg | 51.63± 0.98 o | 29.1±0.11 i |
| V1A0PDI | 76.4±2.64 0 | 242.2±1.02 kl | 283.1±1.04 jk | 124.2±0.77 t | 336.1± 2.06 lm | 853.4±1.06 hi | 44.02±1.56 p | 14.2±1.20 lm |
| V1A0SDI | 54.9±1.27 p | 216.0±2.86 q | 248.4±1.77 n | 116.3±1.05 u | 316.9±2.91 m | 802.8±1.85 mn | 16.28± 0.92 s | 6.23±0.55 m |
| V1A1FI | 125.4±1.03 gh | 277.4±2.15 ef | 307.9±1.24 h | 165.5±0.88 q | 407.7±1.65 h | 884.2±1.07 ij | 74.60±1.82 kl | 34.1±0.78 g |
| V1A1PDI | 109.5±1.43 k | 266.5±2.74 gh | 286.5±2.03 j | 146.3±0.88 r | 397.9±2.06 h | 860.1±0.91h | 54.13± 1.0 o | 25.6±1.59 jk |
| V1A1SDI | 93.2±1.35 mn | 234.2±1.28 l-n | 257.5±0.95 m | 134.3±2.0 s | 376.6±1.48 ij | 824.8±0.91k | 35.87±1.83 q | 13.3±0.66 m |
| V1A2F1 | 186.3±1.12 a | 296.5±2.14 bc | 340.3±1.93 c | 178.2±0.95 o | 427.7±1.56 fg | 898.0±0.99 d | 118.60± 0.95 gh | 48.5±1.29 e |
| V1A2PDI | 112.4±1.52 jk | 279.5±1.66 de | 327.1±0.73 e | 172.8±1.53 p | 412.7± 0.99 gh | 872.8±1.55g | 67.7±1.55 mn | 35.3±1.27 g |
| V1A2SDI | 97.8±1.72 lm | 245.5±2.52 jk | 321.3±0.86 fg | 168.1±1.57 pq | 402±0.9 h | 844.7± 1.03 ij | 76.7±0.99 k | 28.3±1.42 ij |
| V2A0F1 | 116.6±1.21 ij | 232.6±2.33 m-o | 318.4±1.81g | 271.8±1.00 l | 394.1±1.64 hi | 819.2±0.97 kl | 82.4±0.58 j | 33.2±0.69 gh |
| V2A0PDI | 102.3±2.08 l | 224.1±1.30 o-q | 251.7± 1.04 n | 268.2±1.29 l | 372.7± 1.96 j | 802.3±0.98 mn | 68.6±0.61 mn | 17.2±1.53 l |
| V2A0SDI | 92.3±0.77 n | 218.3±0.88 p-q | 248.2± 1.04 n | 254.6±1.38 i | 361.0± 0.99 jk | 797.5±1.47 n | 43.3±1.045 p | 11.1±1.0 m |
| V2A1FI | 126.2±2.03gh | 244.6±2.29 jk | 327.8±1.91e | 296.9±1.20 i | 462.3± 0.85 d | 874.6±1.28 fg | 133.2±1.063 d | 77.8±1.59 c |
| V2A1PDI | 120.3±0.86 i | 237.4±0.43 k-m | 278.7±2.86 kl | 286.9±2.03 j | 442.5± 0.68 ef | 826.9±2.68 k | 118.4±1.22 gh | 48.5±1.28 e |
| V2A1SDI | 93.2±1.61 mn | 227.1±2.35 n-p | 275.4±2.39 l | 276.5±2.10 k | 429.3± 0.86 fg | 816.9±1.93 kl | 64.8±1.74 n | 22.7±0.80 k |
| V2A2F1 | 141.3±1.11 cd | 298.5±0.97 b | 346.9±1.67 b | 318.5± 0.9 f | 551.3±1.01 a | 921.5±1.71 b | 125.5±1.27 ef | 84.4±1.05 b |
| V2A2PDI | 137.1±2.26 de | 270±2.34 fg | 339.9±1.67 c | 311.3± 0.94 g | 527.7±1.53 b | 893.1±1.67 de | 94.2±0.96 i | 52.6±2.21 d |
| V2A2SDI | 127.5±3.07 fg | 257.6±1.1 hi | 282.1±1.04 jk | 302.6±1.78 h | 518.6±1.41 b | 883.8± 0.98 ef | 78.5±0.83 jk | 28.4±1.01 ij |
| V3A0F1 | 121.5±1.81 hi | 252.6±0.97ij | 324.1±1.84 ef | 293.0±1.93 i | 457.1±1.53 de | 837.8±1.21 j | 96.6±2.55 i | 30.6±1.68 hi |
| V3A0PDI | 116.7±3.23 ij | 241.7±0.92 k-m | 320.6±0.78 fg | 262.7±1.16 m | 367.5±1.11 j | 819.6± 0.77kl | 71.0± 0.95 lm | 28.1±1.05 ij |
| V3A0SDI | 109.7±1.11 k | 238.4 ±0.82 k-m | 294.7±1.15 i | 256.4±1.24 n | 344.5±1.27 kl | 810.4±1.11lm | 28.4±1.39 r | 13.3±0.59 m |
| V3A1F1 | 142.8± 2.04 c | 287.9±1.29 cd | 342.6±1.42 bc | 346.7±1.52 c | 489.5±1.24 c | 908.7±1.13 c | 152.2±1.27 c | 55.6±1.02 d |
| V3A1PDI | 127.4±2.07 fg | 273.89±1.95 g | 332.4±1.05 d | 336.4±1.32 d | 442.6± 0.93 ef | 892.5± 0.98 de | 129.1±1.04 de | 44.9±10.6 f |
| V3A1SDI | 118.0±2.09 i  | 266.6±1.32 gh | 324.6±1.40 ef | 327.8±1.91e | 440.3±1.03 ef | 872.8±1.22 g | 113.8± 2.08 h | 22.6±1.07 k |
| V3A2F1 | 151.1±0.85 b | 308.3±1.16 a | 352.7±0.93 a | 362.1±1.42 a | 570.2± 0.69 a | 933.9±1.654 a | 198.5±1.05 a | 87.9±1.24 a |
| V3A2PDI | 145.4±2.49 c | 295.2±1.27 bc | 346.4±1.03 b | 357.4±1.56 b | 531.2±2.07 ab | 922.7±1.35 b | 173.5±0.76 b | 47.9±1.57 ef |
| V3A2SDI | 132.4±1.03 ef | 290.6±1.20 bc | 309.7±0.90 h | 350±0.97 c | 443.1±0.89 b | 898±1.85 d | 124.1±2.3 f | 25.3±1.26 jk |
| Different lowercase letter assessed by 3-way ANOVA of biochar rates, irrigation levels and maize hybrids indicates level of significance at 95% confidence interval. Means sharing different letters have significant differences at *P* < 0.05%.0 tons ha −1 (A0), 5 tons ha −1 (A1), 10 tons ha −1 (A2) of activated biocharFull irrigation (FI), partially deficit irrigation (PDI), and severely deficit irrigation (SDI) |