Title: Seed priming and phosphorus fertilization boost nutrient biofortification of lentil plants, Journal: Journal of Elementology. Authors: Mustafa Ceritoglu, Murat Erman, Fatih Çığ. Affiliation: Faculty of Agriculture, Department of Field Crops, Siirt University, Siirt, Türkiye. E-mail: ceritoglu@siirt.edu.tr

Table S1

Analysis of variance for years and treatments on micro and macro nutrient availability

|  |  |
| --- | --- |
| Traits/Factors | Mean of square/F prob. |
| Year (Y) | Phosphorus (P) | Priming (Pr) | YxP | YxPr | PxPr | YxPxPr |
| Nitrogen | 21.37\*\* | 2.50\*\* | 0.94\*\* | 0.20ns | 0.05ns | 0.63\*\* | 0.33\*\* |
| Phosphorus | 8892408\*\* | 157968ns | 282361\*\* | 143593ns | 59999ns | 163956\*\* | 163634\*\* |
| Potassium | 74141222\*\* | 2058963\* | 1500512\* | 831184ns | 1963705\*\* | 2961964\*\* | 1340523\*\* |
| Calcium | 309821597\*\* | 9456911\*\* | 846971\*\* | 3275233\*\* | 833469\*\* | 713261\*\* | 1268738\*\* |
| Copper | 879.54\*\* | 5,19ns | 7.70\* | 6.66\* | 9.30\*\* | 7.71\*\* | 10.19\*\* |
| Iron | 1341696\*\* | 128229ns | 91484\*\* | 412474\* | 191822\*\* | 95543\*\* | 101026\*\* |
| Magnesium | 15373692\*\* | 429421\*\* | 98257\*\* | 289946\*\* | 44169\*\* | 51294\*\* | 77575\*\* |
| Manganese | 8286.9\*\* | 220.7ns | 64.2\*\* | 197.4ns | 76.7\*\* | 42.8\*\* | 53.9\*\* |
| Zinc | 2448.0\*\* | 12.3ns | 70.1\*\* | 158.4ns | 36.3ns | 67.4\*\* | 53.3\*\* |

(\*: p<0.05, \*\*: p<0.01, ns: no significant difference)

Table S2

Effect of Year x Phosphorus x Priming and Phosphorus x Priming interaction on macronutrient accumulation in lentil plants

|  |  |  |  |
| --- | --- | --- | --- |
| Element | Priming | Year x Phosphorus x Priming | Phosphorus x Priming |
| 2021-22 | 2022-23 |  |
| P0 | P1 | P2 | P3 | P0 | P1 | P2 | P3 | P0 | P1 | P2 | P3 |
| N | Control | 2,09 n | 3,48 a-l | 4,26 a | 3,25 c-m | 2,34 mn | 2,98 b-n | 2,05 d-m | 2,37 mn | 2,22 g | 3,23 a-f | 3,65 ab | 2,81 d-f |
| Pi | 3,00 d-n | 4,16 a-b | 3,47 a-l | 3,33 b-l | 2,59 k-n | 2,89 f-n | 2,85 g-n | 2,95 e-n | 2,80 e-g | 3,54 ab | 3,16 a-f | 3,14 b-f |
| SA | 3,39 a-l | 3,98 a-c | 3,82 a-e | 3,99 a-c | 2,75 j-n | 3,22 c-m | 3,22 c-m | 2,82 i-n | 3,07 b-f | 3,60 ab | 3,52 ab | 3,40 a-d |
| S | 3,88 a-d | 3,54 a-j | 3,82 a-e | 3,25 c-m | 2,86 g-n | 3,26 c-m | 2,99 d-n | 2,56 l-n | 3,37 a-e | 3,40 a-d | 3,40 a-d | 2,90 c-f |
| PGPB | 3,56 a-j | 3,99 a-c | 3,77 a-g | 3,74 a-h | 3,04 d-m | 3,51 a-k | 3,10 c-m | 2,74 j-n | 3,30 a-f | 3,75 a | 3,43 a-c | 3,24 a-f |
| Si | 3,73 a-i | 3,32 b-l | 3,79 a-f | 2,85 g-n | 2,99 d-n | 2,89 f-n | 2,84 h-n | 2,66 j-n | 3,36 a-e | 3,10 b-f | 3,31 a-f | 2,76 fg |
| P | Control | 3210 a-d | 2979 a-h | 3168 a-e | 2752 c-h | 2492 e-h | 2658 c-h | 2658 c-h | 2491 e-h | 2851 a-c | 2622 bc | 2818 a-c | 2956 a-c |
| Pi | 2748 c-h | 3284 a-c | 2878 b-h | 2797 b-h | 2476 f-h | 2682 c-h | 2682 c-h | 2738 c-h | 2612 bc | 2766 a-c | 2983 a-c | 2722 a-c |
| SA | 2828 a-h | 3090 a-g | 3161 a-f | 3629 a | 2460 gh | 2783 b-h | 2563 d-h | 2528 d-h | 2644 a-c | 3079 a | 2936 a-c | 2974 a-c |
| S | 2686 c-h | 2901 b-h | 3100 a-g | 2773 b-h | 2482 e-h | 2691 c-h | 2691 c-h | 2368 h | 2584 c | 2570 c | 2796 a-c | 2772 a-c |
| PGPB | 2894 b-h | 2988 a-h | 3452 ab | 3159 a-f | 3022 a-h | 2695 c-h | 2695 c-h | 2438 gh | 2958 a-c | 2799 a-c | 2842 a-c | 3066 a |
| Si | 3302 a-c | 2949 a-h | 3286 a-c | 3089 a-g | 2801 b-h | 2563 d-h | 2563 d-h | 2648 c-h | 3051 ab | 2869 a-c | 2756 a-c | 2911 a-c |
| K | Control | 3420 b-j | 2975 d-j | 3100 c-j | 4446 a-h | 3817 a-i | 4896 a-e | 4192 a-h | 5375 ab | 3618 a-e | 3935 a-d | 3646 a-e | 4656 ab |
| Pi | 2475 h-j | 2827 f-j | 3769 a-i | 2734 f-j | 4986 a-d | 3539 a-j | 4068 a-h | 3552 a-j | 4011 a-d | 4172 a-d | 3939 a-d | 3143 d-e |
| SA | 4014 a-h | 3027 d-j | 2822 f-j | 4084 a-h | 5548 a | 5518 a | 3429 b-j | 4149 a-h | 4500 a-c | 4910 a | 3125 d-e | 4116 a-d |
| S | 3571 a-j | 4212 a-h | 2923 e-j | 2804 f-j | 4273 a-h | 5099 a-c | 4244 a-h | 4039 a-h | 3922 a-d | 3283 c-e | 3583 b-e | 3422 b-e |
| PGPB | 2736 f-j | 2626 g-j | 1701 j | 2971 d-j | 4223 a-h | 3546 a-j | 4602 a-g | 3730 a-i | 3480 b-e | 3086 de | 3831 a-d | 2508 e |
| Si | 3004 d-j | 3955 a-h | 3061 d-j | 1799 ij | 5293 ab | 4682 a-f | 4866 a-e | 3218 c-j | 4148 a-d | 4318 a-d | 3284 c-e | 3350 b-e |
| Ca | Control | 11955 a-e | 10477 g-k | 11325 b-i | 11610 a-h | 8189 p | 8425 op | 8794 o-p | 8995 n-p | 10072 a-g | 9451 f-h | 10059 a-g | 10303 a-f |
| Pi | 9753 j-o | 10330 h-m | 10370 h-l | 12700 a | 9061 l-p | 8686 op | 8875 op | 8752 op | 9407 gh | 9508 e-h | 9622 d-h | 10726 a |
| SA | 10545 f-j | 10795 d-j | 12080 a-d | 11490 a-i | 7948 p | 8397 p | 9162 k-p | 8572 op | 9246 gh | 9596 d-h | 10621 a-c | 10031 a-g |
| S | 10211 j-n | 10640 e-j | 12655 ab | 12265 a-c | 8552 op | 8577 op | 8459 op | 9017 m-p | 9381 gh | 9608 d-h | 10557 a-c | 10641 ab |
| PGPB | 10243 i-n | 10306 h-n | 11835 a-f | 11485 a-i | 8012 p | 8311 p | 8250 p | 8655 op | 9127 h | 9309 gh | 10043 a-g | 10070 a-g |
| Si | 10510 f-j | 11040 c-j | 11810 a-f | 11715 a-g | 9034 m-p | 8543 op | 8819 op | 9087 l-p | 9772 c-h | 9792 b-h | 10315 a-e | 10401 a-d |
| Mg | Control | 2964 a-f | 2709 c-k | 2870 b-h | 2702 d-k | 2092 pq | 2276 n-q | 2364 l-q | 2281 n-q | 2528 b-g | 2492 c-h | 2617 a-f | 2491 c-h |
| Pi | 2412 j-p | 2711 c-k | 2747 b-j | 3040 a-c | 2173 pq | 2312 m-q | 2261 o-q | 2128 pq | 2292 h | 2511 c-h | 2504 c-h | 2584 a-f |
| SA | 2633 f-m | 2875 b-h | 3026 a-d | 3025 a-d | 2056 q | 2315 m-q | 2348 l-q | 2033 q | 2345 gh | 2595 a-f | 2689 a-d | 2529 b-g |
| S | 2528 i-o | 2855 b-i | 3216 a | 3011 a-d | 2284 n-q | 2544 h-o | 2284 n-q | 2292 n-q | 2406 f-h | 2700 a-c | 2750 a | 2651 a-d |
| PGPB | 2602 g-n | 2662 e-l | 3052 ab | 2931 a-g | 2242 o-q | 2271 n-q | 2418 j-p | 2346 l-q | 2422 e-h | 2466 d-h | 2735 ab | 2638 a-e |
| Si | 2746 b-j | 2832 b-i | 2991 a-e | 3021 a-d | 2410 k-p | 2344 l-q | 2274 n-q | 2230 o-q | 2578 a-f | 2588 a-f | 2633 a-f | 2626 a-f |

Table S3

Effect of Year x Phosphorus x Priming and Phosphorus x Priming interaction on micronutrient accumulation in lentil plants

|  |  |  |  |
| --- | --- | --- | --- |
| Element | Priming | Year x Phosphorus x Priming | Phosphorus x Priming |
| 2021-22 | 2022-23 |  |
| P0 | P1 | P2 | P3 | P0 | P1 | P2 | P3 | P0 | P1 | P2 | P3 |
| Fe | Kontrol | 651 d-k | 624 f-k | 680 d-k | 631 e-k | 833 b-k | 1048 b-d | 1100 bc | 760 c-k | 742 b-d | 836 b-d | 890 a-d | 696 cd |
| Pi | 856 b-k | 521 k | 685 d-k | 742 c-k | 554 jk | 995 b-g | 791 c-k | 834 b-k | 705 cd | 758 b-d | 738 b-d | 788 b-d |
| SA | 590 g-k | 571 h-k | 791 c-k | 1212 ab | 676 d-k | 871 b-k | 847 b-k | 672 d-k | 633 d | 721 b-d | 819 b-d | 942 a-c |
| S | 756 c-k | 694 c-k | 795 c-k | 860 b-k | 770 c-k | 1546 a | 746 c-k | 1036 b-e | 763 b-d | 1120 a | 770 b-d | 948 a-c |
| PGPB | 735 c-k | 546 jk | 622 f-k | 601 g-k | 942 b-j | 1018 b-f | 1039 b-d | 962 b-i | 839 b-d | 782 b-d | 830 b-d | 781 b-d |
| Si | 559 i-k | 734 c-k | 971 b-h | 752 c-k | 769 c-k | 796 c-k | 969 b-h | 619 f-k | 664 d | 765 b-d | 970 a | 686 cd |
| Zn | Kontrol | 33,3 b-e | 28,2 b-h | 32,8 b-f | 35,4 a-c | 24,6 c-f | 22,5 e-h | 25,3 c-h | 24,5 c-h | 29,0 a-c | 25,4 bc | 29,1 a-c | 30,0 a-c |
| Pi | 28,1 b-i | 46,7 a | 25,9 b-h | 38,0 ab | 24,8 c-h | 22,8 e-h | 23,8 c-h | 22,2 b-h | 26,5 bc | 34,7 a | 24,9 bc | 32,6 ab |
| SA | 27,6 b-h | 29,8 b-h | 30,1 b-h | 33,8 b-e | 21,0 f-h | 22,7 e-h | 27,0 b-h | 23,5 c-h | 24,3 c | 26,3 bc | 28,6 a-c | 28,6 a-c |
| S | 25,5 c-h | 28,1 b-h | 32,5 b-g | 28,1 b-h | 28,9 b-h | 20,5 gh | 23,3 d-h | 19,1 h | 27,2 a-c | 24,3 c | 27,9 a-c | 23,6 c |
| PGPB | 29,9 b-h | 29,8 b-h | 33,6 b-e | 31,1 b-h | 35,1 a-d | 22,2 e-h | 23,0 d-h | 28,0 b-h | 32,5 ab | 26,0 bc | 28,3 a-c | 29,5 a-c |
| Si | 27,4 b-h | 34,2 b-e | 32,1 b-g | 31,0 b-h | 24,5 c-h | 22,1 e-h | 22,3 e-h | 23,1 d-h | 26,0 bc | 28,2 a-c | 27,2 a-c | 27,1 a-c |
| Cu | Kontrol | 17,21 ab | 13,29 b-g | 11,22 c-l | 10,94 d-l | 7,86 l | 9,47 e-l | 8,89 g-l | 7,78 l | 12,53 ab | 11,38 a-d | 10,05 b-d | 9,36 cd |
| Pi | 12,22 c-l | 12,82 b-k | 12,33 c-l | 13,11 b-h | 8,28 kl | 9,14 f-l | 8,40 i-l | 8,54 h-l | 10,25 b-d | 10,98 a-d | 10,36 b-d | 10,82 a-d |
| SA | 14,10 a-d | 12,93 b-j | 11,47 c-l | 13,55 b-f | 9,00 f-l | 9,48 e-l | 8,91 g-l | 8,35 j-l | 11,55 a-d | 11,21 a-d | 10,19 b-d | 10,95 a-d |
| S | 12,97 b-i | 11,46 c-l | 13,78 b-e | 12,72 b-k | 8,77 g-l | 10,25 d-l | 8,40 i-l | 8,40 i-l | 10,87 a-d | 10,85 a-d | 11,09 a-d | 10,56 b-d |
| PGPB | 14,32 a-d | 10,97 b-l | 12,30 c-l | 10,20 d-l | 9,50 e-l | 9,42 e-l | 8,76 g-l | 8,27 kl | 11,91 a-d | 10,19 b-d | 10,53 b-d | 9,23 d |
| Si | 11,56 c-l | 15,73 a-c | 13,85 b-e | 18,64 a | 9,44 e-l | 8,72 g-l | 8,51 i-l | 8,43 i-l | 10,50 b-d | 12,20 a-c | 11,19 b-d | 13,53 a |
| Mn | Kontrol | 54,3 a-f | 51,2 b-i | 54,4 a-f | 48,9 d-k | 38,8 k-o | 41,7 j-o | 46,0 e-l | 37,3 l-o | 46,6 a-f | 46,5 a-f | 50,2 ab | 43,1 d-f |
| Pi | 44,1 g-n | 52,3 a-h | 48,9 d-k | 53,2 a-h | 36,3 l-o | 45,4 f-m | 37,9 l-o | 37,9 l-o | 40,2 f | 48,8 a-d | 43,4 c-f | 45,5 b-f |
| SA | 45,9 e-l | 54,7 a-f | 58,8 a-d | 61,7 a | 35,4 m-o | 41,3 i-o | 40,0 k-o | 33,8 o | 40,7 ef | 48,0 a-d | 49,4 a-d | 47,8 a-d |
| S | 50,9 c-j | 52,7 a-h | 61,3 ab | 55,8 a-e | 39,0 k-o | 52,3 a-h | 34,9 no | 43,2 h-o | 45,0 b-f | 52,5 a | 48,1 a-d | 49,5 a-d |
| PGPB | 50,8 c-j | 50,5 c-j | 58,2 a-d | 52,2 a-h | 40,8 j-o | 43,4 g-o | 41,6 i-o | 43,3 h-o | 45,8 b-f | 46,9 a-e | 49,9 a-c | 47,7 a-d |
| Si | 51,1 c-i | 53,5 a-g | 60,6 a-c | 56,2 a-d | 39,1 k-o | 40,8 j-o | 39,8 k-o | 36,9 l-o | 45,1 b-f | 47,2 a-e | 50,2 ab | 46,6 a-f |