**Exp-II b. Rapid screening of sunflower genotypes for P acquisition in soil with differential P levels-Poly bag technique (2013-2016)**

 Based on the protocol for rapid screening of sunflower in solution culture, the critical P level for sunflower to express deficiency symptoms and poor dry matter was between 2-4ppm. A method was devised to screen genotypes simulating soil condition. Poly bag technique was adopted to screen genotypes to study the root morphology and microbial association responsible for high P acquisition against differential P levels in soils. Based on two years study, it was found that 4 genotypes out of 77 were efficient in P acquisition under stress situation. These four were further evaluated for its P acquisition and root parameters under stress situation in the final year of the project in 2015-16.

**Technical details**

* No of identified genotypes: 4 (HOHAL-17, CSFI-5075, HOHAL-22 & CSFH-8712)
* 2 P levels: 1. Low P soil (9.3kg/ha) and 2. High P soil (58 kg/ha)
* Uniform N and K was applied as per RDF
* No of Replication: 5
* DOS: 17-08-2015
* DOH: 20-09-2015
* Checks: CMS-335A & DRSH-1
* CMS-335A was excluded due to poor germination

Objective 1: To evaluate identified sunflower genotypes for P acquisition at stressed (NMNF=8.4 kg P/ha) and sufficient levels (150% RDF=58 kg P/ha) of LTFE soil

Results Highlights

|  |  |  |  |
| --- | --- | --- | --- |
|  | P Content (%) | Dry matter (g/pl) | P Uptake (mg/g) |
| Genotype | P1(+P)  | P2(- P)  | Mean | P1(+P)  | P2(- P)  | mean | P1(+P)  | P2(- P)  | Mean |
| HOHAL-17 | 0.23  | 0.40  | 0.32  | 1.37  | 3.06  | 2.21  | 3.28  | 12.42  | 7.85  |
| CSFI-5075  | 0.41  | 0.32  | 0.36  | 2.18  | 1.76  | 2.22  | 8.93  | 5.69  | 7.33  |
| HOHAL-22 | 0.39  | 0.31  | 0.35  | 2.08  | 2.23  | 2.15  | 8.31  | 6.98  | 7.65  |
| CSFH-8712  | 0.29  | 0.22  | 0.25  | 1.50  | 0.69  | 1.09  | 4.49  | 1.55  | 3.02  |
| DRSH-1  | 0.41  | 0.18  | 3.00  | 1.57  | 0.46  | 1.02  | 6.48  | 0.86  | 3.67  |
| Mean | 0.35  | 0.29  |  | 1.84  | 1.64  |  | 6.73  | 5.50  |  |
| CV(%) | 9.24  |  |  | 9.67  |  |  | 12.89  |  |  |
| CD (0.05) Genotype | 0.028  |  |  | 0.15  |  |  | 0.75  |  |  |
| P levels | 0.017  |  |  | 0.10  |  |  | 0.45  |  |  |

Objective 2: To evaluate identified sunflower genotypes for root variation grown under P stressed and sufficient conditions

|  |  |  |
| --- | --- | --- |
|  | Root length (cm/pl) |  Root volume (cc/pl) |
| Genotype | P1(+P)  | P2(- P)  | mean | P1(+P)  | P2(- P)  | Mean |
| HOHAL-17 | 22.4  | 27.0  | 24.7  | 5.32  | 15.17  | 10.25  |
| CSFI-5075  | 22.1  | 33.7  | 27.9  | 7.12  | 8.32  | 7.72  |
| HOHAL-22 | 15.8  | 15.8  | 15.8  | 5.17  | 5.17  | 5.17  |
| CSFH-8712  | 17.5  | 17.0  | 17.2  | 1.82  | 1.82  | 1.82  |
| DRSH-1  | 21.6  | 13.9  | 17.8  | 7.32  | 1.37  | 4.35  |
| Mean | 19.9  | 20.7  |  | 5.35  | 6.37  |   |
| CV(%) | 9.01  |  |  | 4.06  |  |   |
| CD (0.05) Genotype | 0.50  |  |  | 0.78  |  |   |
| P levels | 0.31  |  |  | 0.48  |  |   |

**Results and Discussions**

 Based on the previous screening trials, four P efficient sunflower genotypes *viz*., HOHAL-17, CSFI-5075, HOHAL-22, CSFH-8712 and a check (DRSH-1) were further evaluated during *kharif* 2015 in order to validate P acquisition trait of genotypes in soils collected from the LTFE experiment treatments (No manure no fertilizer treatment plot for Low P and the soil from 150% RDF treatment for high P situations, respectively). The results showed that the highest P acquisition was noticed in genotype HOHAL-17 (7.2mgP /g dry matter) under P stress situation and was followed by CSFI-5075 (5mgP/g DM). Further, the results pertaining to root parameters under low P situation, genotype HOHAL-17 showed the highest root volume (16cc/pl) followed by CSFI-5075 (9 cc/pl). Similarly, highest root length was observed in CSFI-5075 (33cm/pl) and followed by HOHAL-17 (27cm/pl). Genotypes with such root traits could be responsible for high P acquisition in marginal P soils and further has to be evaluated in different soil types. Hence, a pot experiment during *rabi* 2015-16 has been planned to evaluate the above genotypes in black soils for acquisition of native P. Growth of genotype HOAL-17 under differential P situation is shown in fig1 (LHS and RHS) below.

  

 Fig1. Left image: Genotype HoHAL-17 in low P soil (8.4 kg/ha; LHS) and P sufficient situation high P soil (58 kg/ha; RHS). Right image: Root growth of HOHAL-17 in P starved soil at 30 days during 2015-16.