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Evaluation of potential rhizobacterial isolates associated with *Spinacea oleracea* for their plant growth promoting activities under pot conditions

Indranil Sarkar and **Pratibha Prashar**
Manav Rachna International University, India

Plant growth promoting rhizobacteria are one of the most beneficial bacterial strains found in rhizosphere which has been seen to improve crop yield leading to its extensive use in the field of organic farming. This study was carried-out to evaluate nine rhizobacterial strains associated with *Spinacea oleracea* for different plant growth parameters under pot conditions. The tested rhizobacterial strains were isolated in a previous study from soil that had been cultivated with *Spinacia oleracea* for at least three consecutive seasons. This study is further extension of our work which involved the *in vitro* analysis of the rhizobacterial strains for different plant growth promoting activities. In this pot study, all the rhizobacterial strains showed positive result in terms of improvement in plant growth parameters when compared to that of control specimen. Strains R13, R40, R50 and R53 showed best plant growth parameters. The shoot length of plants were inoculated with isolate R13, R40, R50, R53 was 32 cm, 26.5 cm, 34 cm, 38.6 cm respectively, compared to control i.e., 21 cm, whereas root length for the same isolates were 8 cm, 15 cm, 12.5 cm, 8 cm respectively, compared to control i.e., 9.5 cm. Number of leaves per plant for these strains was 8 units, 6 units, 8 units and 7 units respectively, compared to control i.e., 6 units and leaf area was 20 cm^2, 18.15 cm^2, 20.07 cm^2 and 13 cm^2 respectively, compared to control i.e., 19.68 cm^2. These results suggest that isolate R13, R40, R50, R53 may be tested further for more plant growth promoting traits eventually developing it as potential soil inoculants in order to enhance the growth of *Spinacia oleracea*.

indranilbiotechengg@gmail.com

Identification of QTLs for morpho-physiological traits in WL711/C306 wheat RIL population under water deficit stress environments

Kalpana Singh, Neeta Dwivedi and **Renu-Khanna Chopra**
Indian Agricultural Research Institute, India

Drought is by far the most important environmental stress in agriculture and many efforts have been made to improve crop productivity under water-limiting conditions. A population of 206 recombinant inbred lines (RILs) derived from WL711/C306 was phenotyped for flag leaf area (FLA), plant habit (PHBT) and cell membrane stability (CMS) under WDS and irrigated environment. The RIL population showed considerable variation, normal distribution and transgressive segregation for FLA, PHBT and CMS under WDS. The genetic linkage map of WL711/C306 RIL population was constructed comprising of 346 markers. The total map distance was 4526.8cM with an averaged interval of 12.9cM between adjacent markers. Major consistent QTL for FLA, PHBT and CMS were identified on chromosomes 2DS, 3BS, 4BL and 7AL in the WL711/C306 RIL population under WDS. The Major QTL's qFLAWD.2D.1 and qCMSWD.3B.1 were located on chromosome 2DS and 3BS respectively with positive allele being contributed by C306, a drought resistant parent accounting for a large proportion of phenotypic variance. Two candidate genes Ghd7 for grain yield and heading date and OsCDK4 for calcium dependent protein kinases were identified in the 2DS and 3BS QTL regions on comparison with gene content of rice chromosomes 7 and 1 respectively. Hence, after validation, markers associated with QTLs qFLAWD.2D.1 and qCMSWD.3B.1 may be used by wheat breeders in the marker assisted breeding for flag leaf area and maintain cell membrane integrity for contributing grain yield in wheat.

kalpanaschauhan@yahoo.co.in