Summary
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Biological nitrogen fixation (BNF) is an important area of research which centres around fixing atmospheric nitrogen by improving the efficiency of dinitrogen fixers. In symbiotic nitrogen fixation, rhizobia play an important role but the nitrogen fixing ability of the organism suffers under stress conditions as well as by the application of nitrogenous fertilizers. Therefore, it becomes imperative to look for an ideal rhizobial strain endowed with not only stress tolerance but also with higher rate of nitrogen fixation. No doubt, such an efficient strain can be created by genetic engineering or through mutation programmes. But to display such improved strains in the open field, there are government-imposed restrictions and even if permission is sought from the environmental agencies, still the improved rhizobial strains do not perform better in the natural environment, as they are not able to cope up with the native rhizobial strains and competitively can not multiply in a myxotrophic environment.

Therefore, in order to circumvent the problem, the present study had screened different soils such as saline soil, tannery polluted-soil and virgin soil employing garden soil as the control. The rhizobial strains were isolated from these soils using YEMA medium and they were later confirmed as rhizobia through various biochemical tests as well. Infact, the nodulating rhizobia from the respective soils were trapped through nodule-trap method using different species of vigna namely *Vigna mungo*, *V. radiata* and *V. unguiculata*. These plants were grown directly in the respective soils, the root nodules collected, the rhizobia isolated and further subcultured for
inoculum preparation. These nodulating rhizobial strains were identified as Rhizobium species of cowpea miscellany group which are generally slow growers (Bradyrhizobia). The respective strains of Bradyrhizobia from different soils were found to nodulate all the three species of *Vigna*. The rhizobial inoculum through seed-pelleting method increased the morphometric parameters of plants such as height and leaf area. The nodulating potential of the rhizobial strains was also confirmed by Leonard jar experiment, wherein profound nodulation was observed compared to the control, employing garden soil rhizobia.

Generally application of rhizobia resulted in an increase in aerial as well as underground biomass coupled with more nodule formation and economic yiled. The nodules formed by the rhizobial inoculum were viable, as they contained root nodule pigment, leghaemoglobin. This is further substantiated by higher activity of nitrogenase in these nodules. From such nodules, rhizobia were isolated and subcultured and were found to have nodulating potential.

From the overall perusal of the results of the study, it is evident that in the promotion of morphometric parameters, biomass production, root nodule numbers and economic productivity in terms of pod yield, number of seeds/pod as well as seed weight, the rhizobial strains could be arranged in the order of hierarchy as follows.

Virgin soil > saline soil > polluted soil > garden soil.
One of the challenging problems in the present day agriculture is the effectiveness of nodule rhizobia to fix atmospheric nitrogen even in the presence of moderate amount of nitrogenous fertilizers including nitrate. Therefore, still the drive is on in search of resistant rhizobial strains to nitrate application. In consonance with this, the rhizobia that have been isolated from the virgin soil, saline soil and polluted soil through root nodule trap method exhibited comparatively higher level of nitrate reductase, when such nodules were assayed for the enzyme, compared to the garden soil rhizobia-induced nodules. Therefore, it appears that the rhizobia from the virgin soil and tannery-polluted soil may perform comparatively in a better way in the presence of nitrogenous salts. Even the nitrogenase activity was comparatively higher in these root nodules induced by rhizobia from the virgin soil, saline soil and tannery polluted soil respectively.

Another interesting feature is that these rhizobia (extraneous origin) when introduced into the garden soil, performed competitively better with the native garden soil rhizobia as well as in combination with other native microbes present in the soil. Therefore, introduction of these rhizobia in the soil, does not pose any problem.

Another significant finding is that, these rhizobia perform well against salinity. Even when the experimental plants were irrigated with artificial saline water, saline soil rhizobia, polluted soil rhizobia and virgin soil rhizobia in the order of preference induced more number of nodules at higher salinity, whereas, the performance of the garden soil rhizobia was rather poor. The above inference is further supported by higher levels of leghaemoglobin in these root nodules.