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Ã¢â?¬Å?Quality bananas for youÃ¢â?¬?

09 September 2013 | Features | By Rahul Koul Koul

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Banana is the most widely grown fruit crop in world and rank fourth after rice, wheat and maize in financial terms. In recent times, the micropropagated varieties have become desired planting materials for farmers all over the world. In that regard, somaclonal variations, either genetic or epigenetic in nature, have been considered an integral part of in-vitro regeneration

process, as a tool for plant improvement as well as development of new varieties. However, few also show characteristic feature inferior to the mother plants and causes heavy yield and economic loss to farmers as well as industry.

Therefore it is important to characterize, select and assess the somaclonal variants for presence of elite and off-types traits observed during in-vitro regeneration or in farmers' field. Keeping that under consideration, a research project on identification of molecular markers associated to characteristic features of elite and off-type plants of banana was started at R&D lab of Aditya Biotech Lab Research Private Limited (ABLR) at Raipur, Chattisgarh in the year 2012. The project "Identification of DNA markers linked to elite traits in micro-propagated banana plants" was funded by DBT under Small Business Innovative Research Initiative (SBIRI). The studies in project include genotypic and phenotypic evaluation of elite and off-time plants during in vitro and in open fields. Total budget of the project is Rs 79.32 lakh out of which Rs 38.97 lakh is supported by SBIRI grant and Rs 40.35 lakh is company's contribution. The project is being monitored and guided by Dr Parmajit Khurana, professor, plant molecular biology, University of Delhi and DrT. R. Sharma, principal scientist, National Research Centre on Plant Biotechnology, Indian Agricultural Research Institute, New Delhi.

The four elite clones (BAT, GA, BHM, DRG) of Gaindnaine variety of banana collected from different locations of India and original clone (G9) from Israel were chosen for the studies. All five clones with varied characters in terms of fruit number, fruit length, bunch weight etc. were cultured in vitro and subsequently planted in field for phenotypic and genotypic studies. These variations were sustained during primary and secondary hardening. Genotyping of elite Grandnaine clones and original clone from Israel showed certain variation at molecular level. While screening twenty six markers which included ISSR, RAPD & SSR we found 3 markers i.e. OPA 12, OPE 1 & OPY11 among the RAPD primers and IG 05 & IG 10 among the ISSR primers to have distinct and reproducible fingerprint pattern between the original clone and rest 4 local elite clones. In the initial finding some RAPD primers were found to be showing polymorphism in between the local clones as well as with respect to the original mother clone from Israel.

Explaining further, Dr Sanket Thakur, chief scientist and head (research and development), ABLR, "Somaclonal variants reported in micro-propagation based mass multiplication of banana plants is a major constraint today. However, some of the somaclonal variants might possess features related to higher yield, fruit quality or favorable growth parameters. Study and identification of DNA markers linked to such desirable traits would significantly helpful in developing banana varieties with better yield or field performance. We aim at developing an efficient and quick mean for identification of high yielding elite banana cultivars suitable for micropropagation. Under the present research project somaclonal variants produced during in-vitro subcultures and hardening stages are being characterized at morpho-physiological and molecular levels to identify linked molecular markers."

Way Forward:

The characterization and identification of high yielding genotypes based on somaclonal variations observed in presently cultivated banana varieties such as Grand Naine would be beneficial for farmers and tissue culture plants producers. Genetic analysis of the desirable traits present in these variants using SSR and ISSR markers would ensure genetic fidelity of the planting materials as well as linking the off type traits observed among tissue culture (TC) raised populations.

The results are found to be in accordance with the morphological traits as well which were observed in the fruiting pattern of grand naine being cultivated in Israel. In future , R&D team is expecting to obtain a significant variation which would ultimately lead to development of better clone or variety of banana for tropical and sub-tropical regions.
The usefulness of markers in tagging and linking to the desirable traits has been demonstrated decades ago. Development of molecular markers tagged to the elite and off-types traits are required in micro propagated banana plants. Apart from development of new high yielding cultivars, DNA markers linked to variant phenotypes in banana will be useful in assessing genetic fidelity of the micro-propagated material as well as farmers' rights and assuring compensation against supply of not true to type TC plants.

Dr Thakur appreciates the support of DBT to such projects. He explains,"Until recently, the research efforts of private industries have not been recognized by public sectors, however introduction of such PPP research projects may open new vistas in Indian biotech industries. The SBIRI initiative of DBT has combined the two poles of academia and industries for joint efforts of implementing need based commercially viable research projects."