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In-Situ Conservation of Valuable Underutilized Leafy Vegetables Through Village Seed/ Gene Bank Approaches

Leafy vegetables are rich in iron, zinc, anti-oxidants, vitamins, dietary fibres and proteins. The Gene/ Seed banks are to be established for conservation and maintenance of leafy vegetables. It enables participatory approaches for selection and multiplication of locally adapted lines of leafy vegetables. This village level gene/ seed bank methods offer conservation of valuable genetic stocks *in-situ* without losing their genetic characteristics of low and no input responses.

INTRODUCTION

Leafy vegetables are important sources of iron, zinc, anti-oxidants, vitamins, dietary fibres and proteins. They are primitive food crops being domesticated by tribes of various parts of the world. Since they are part of their diet and health, they are part of their agro ecological system (Selladurai *et al.*, 2018). Leafy vegetables are low or no input responses species and mostly are self-sown in nature, grow in natural habitats due to their intrinsic abilities to withstand biotic and abiotic stresses, to acquire and utilize nutrients. They are essentially free from pesticides and other agro- chemical inputs necessitating the safety of the produces for consumption. They are directly involved in colonization and growth of gut bacteria of human which are involved in several health benefits. They are having pre and probiotic nature. Leafy vegetables like amaranth, *Hibiscus subdariffa*, mountain spinach are very important sources of iron and zinc as well as sources and media for pre and pro biotic bacterial nature of human gut.

NEED FOR *IN-SITU* CONSERVATION OF UNDERUTILIZED LEAFY VEGETABLES

Though leafy vegetables are having numerous health and nutritional benefits, large scale cultivation for the supply of ever growing population is always at lower levels. The main reasons are lack of required seed quantities and distinct cultivar types. They are mostly self-sown being grown in natural habitats and gathered by local inhabitants for consumption. They don't purposely go for collecting the leaves. During weeding of crops, and other cultural operations like plucking of vegetables or hand hoeing, leafy vegetables are being collected and brought home for consumption. They don't cultivate it essentially. So the production level is low and they are meant for local consumption (households or may be village levels). Whatever the leafy vegetables come to the vegetable markets of cities are through cultivation and most of the times, only meagerly supplied and having huge demands. Main reason for not taking up of leafy vegetables in larger scale cultivation despite its profitable nature, are mainly attributed by lack of required quantities of seeds of ecotypes. Low and no input response eco types of leafy vegetables with higher nutritional values will be cultivated in farmer's fields for popularization followed by systematic approaches for seed production and supply to the farmers. Gene/ Seed banks will be established in selected villages for *in-situ* conservation and maintenance of leafy vegetables.

ADVANTAGES OF *IN-SITU* CONSERVATION OF LEAFY VEGETABLES

Nutrient profiling of underutilized leafy vegetables will be very much useful for popularizing them to lower income group of population for the nutritional and health benefits. Village gene/ seed bank approach is highly relevant and sustainable for conservation of valued and important genetic resources of underutilized vegetables. It enables participatory approaches for selection and multiplication of locally adapted lines.

BENEFICIAL EFFECTS OF CONSERVATION AND UTILIZATION ON SMALL HOLD FARMERS

1. Small farmers will be trained on aspects of seed production, maintenance and cultivation of underutilized leafy vegetables.
2. Small farmers have the inherent inability of incurring high cost for cultivation of crops, so their income generation has always been low. Underutilized leafy vegetables have huge market potentials in urban, sub-urban and local markets, due to lack of availability of quality seeds in required quantities, only a meager quantity is produced and supplied. Underutilized leafy vegetables are low and have no input responses. Hence, the cultivation of underutilized leafy vegetables incurs low cost by the small farmers but farmers will be assured of stable and higher income generation throughout the year.
3. Farmers will be trained with suitable crop rotation practices, organic farming practices, low and no input response practices for cultivation, seed production and maintenance of underutilized leafy vegetables.
4. There is increased awareness among urban consumers to consume diet items which have higher amounts of zinc, iron and anti-oxidants to boost up immunity and protective against disorders like cancer, diabetes and cardiac. Underutilized vegetables will serve as a much cheaper source not only for urban masses, but also for the low income people of sub-urban and poor masses of rural areas.
5. Farmers will have additional income by selling seeds which always generate higher revenues and demand is there throughout the growing seasons of the year, even during offseason like summer.

PROCEDURES FOR THE *IN-SITU* GENETIC CONSERVATION

Genetic characterization of accessions and selection of superior lines

Local land races will be identified from the respective agro ecological zone and identified as eco type of the particular region. Genetic resources will be constituted from different agro-ecological zones and analyzed for genetic diversity within and across the populations. Nutrient profiling has to be done for all the collected lines. Promising lines will be selected based on nutrients content, low and no input responses without inbreeding depression. The better performing progenies are raised to multiply seeds.

Participatory approaches for selecting superior lines, Seed multiplication and popularization in farmers' fields

Selected superior lines along with few local types as checks (open pollinated and non-selected populations) will be evaluated in farmer's field for participatory based selection. Criteria like greens yield/ grain yield, duration, low and input responses, cooking and taste qualities will be imposed for selection.

Establishment of village level seed / gene bank

Superior populations of leafy vegetables will be popularized in farmers' field by conducting front line demonstrations (FLDs) followed by field days. Farmers will be trained on the aspects of low input / no input practices and inputs in cultivation of leafy vegetables, seed yield maximization, storage and maintenance. Village level gene/ seed banks will be established by forming a farmer groups in selected villages for the continuous production and supply of seeds and leafy vegetables for markets. Seed /gene banks will serve as connecting centre for seed storage and supply by procuring from farmers and supply to the farmers.

CONCLUSION

Leafy vegetables comprise valuable genetic stocks in terms of food and nutritional requirements in the natural habitats. Systematic conservation and utilization will help for the small farmers and consumers in terms of income generation as well as supplying cheaper sources of essential nutrients like zinc and iron. It is a systematic process by identifying the genetic hot spots followed by collection evaluation, multiplication of seeds followed by seed supply. Village level gene/ seed bank methods offer conservation of valuable genetic stocks *in-situ* without losing their genetic characteristics of low and no input responses.

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