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Breeding strategies for improving fodder security in Semi-Arid Tropics (SAT)

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Introduction

Semi-Arid Tropic region extends in 55 countries of the world mostly developing nations which extend from Asia to Africa and provides home for 38 % of total poor of the world (Thornton *et al*., 2000). South Asia holds maximum areas under SAT which is followed by the countries from African continent and South America. The region is under tremendous change and facing acute problem of water, land degradation and soil health and loss of biodiversity. Demand for livestock product in the region is growing much more rapidly than the demand for food grains. Livestock numbers have increased significantly in all SAT regions for all categories of livestock over the last three decades. Increasing population of livestock in the region has created huge pressure on the available fodder resources. To meet the deficit in all components of fodder, dry crop residues and feed has to be met from either increasing productivity, utilizing untapped feed resources or increasing land area under fodder crops. The region primarily depends on annual dual purpose fodder crops *viz*., sorghum, pearlmillet, maize, oats, cowpea, clovers and perennial crops like lucerne and range grasses and legumes. The present paper deals about the current status, recent research and development and opportunities which can be effectively utilized for ensuring feed and fodder security in the region.

Materials and Methods

The breeding objectives for fodder crops includes biomass yield improvement, better quality and digestibility, tolerance to biotic and abiotic stresses, high response to inputs, high and quick regeneration, enhancing the variability in low genetic base crops and improving crops for dual purpose utilization to the reduce competition with food crops. The major breeding plans to improve the fodder resources should be comprehensive and must deal with all the important objectives. The crop and situation based strategies are required to evolve the better varieties and enhancing the fodder security. Enrichment of fodder genetic resources is urgently required as fodder crops occupy only 9 % of total germplasm collection. Characterization and evaluation of available germplasm and sub-setting for various traits through FIGS approach (Khazaei *et al*., 2013), utilization of pre-breeding approaches for transfer of important traits from primary and secondary gene pool, identification of sexual lines in apomictic grasses, discovery and diversification of male sterility sources, tapping the potential range grasses, utilization of new information generated through genome mapping in different crops. Drought and heat tolerance which is difficult to improve through conventional approaches, functional genomics and recombinant DNA technology (Serageldin and Persley, 2000) can be effectively deployed.

Results and Discussion

Forage breeding has been given less priority among all breeding progammes compared to food and commercial crops. Even though CGIAR institute like ICRISAT which is exclusively working for SAT region, in their mandated crops like sorghum and pear millet major focus is towards breed the varieties for the human consumption. The shares of forage crops germplasm in world gene banks are very low. However, a recent development the establishment of Australian Pasture Gene Bank is right move in the direction and more such initiative is required. Re-prioritization of breeding progamme at many institutes have been initiated to give development of suitable fodder varieties in their mandated crops. The genetic resources available in secondary and tertiary gene pools have been utilized for the generation of variability and transfer of desirable gene eg. *Pennisetum purpureum, P. squamulatum, P. pedicellatum*, *P. polystachion* and *P. subangustum* in pearl millet, *Sorghum halepense*, S. *propinquum*, *S. almum*, *S. drummondii* and *S. arundinaceum* in sorghum. Similarly in other crops *viz*., oats, guinea grass, Egyptian clover, Lucerne and other legume crops, wild species have successfully utilized. Generation of wide base population, inter and intra population improvement and hybrid development has been successfully achieved in all important fodder crops. Genome mapping in consortium mode is under progress in many crops and expected to be available very soon. Dual purpose crops with stay green and nutritional attributes in stovers have been developed and nutraceutical values of many crops have enhanced to provide high quality fodder to the animals. However, early maturing varieties with high per day productivity and suitable to changing climate are essentially required to cater the rising needs fodder in SAT region.

Conclusion

The large increase in demand for livestock products is likely to improve the economic and social conditions of the poor of the region. However, key factor remains the self-sufficiency for feed and fodder. The recent research and development in the area of plant breeding and biotechnology has given a wide array of options of techniques for improving the fodder crops and grasses. The breeding programmes for dual purpose crops needs to be re-oriented to give equal value for fodder related traits. Use of biotechnological tolls in the improvement of perennial grasses needs to be increased for the better understanding of genetics, allele mining and breeding problems where conventional methods fail.

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