REPORTED

ALLIUM ROYLEI STEARN – A PROMISING MINOR CROP SPECIES.

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Abstracts: Recently Gopal (2014) in the meeting report on National Workshop on "Onion Improvement and Seed Production" laid emphasis on the prevention of onion shortage through genetic improvement. A number of bottlenecks brought to the fore included susceptibility to diseases, weather vagaries and non – availability of quality seeds. Among various remedial measures proposed to solve these problems; genetic improvement for better seed supply of onion was the most pronounced. Numerous gene transfer methods and breeding programmes were conducted and many are underway. The wild relatives of crop plants constitute important resource for improving agricultural production and also for maintaining sustainable agro-ecosystems. This, in trun, will ensure food security for the new millennium.

Keywords: Crop, Disease, Species, Onion

INTRODUCTION

Many wild species of *Allium* are repositories of numerous disease resistance and other desirable genes which can be exploited for the improvement of common onion (de Vries *et al*., 1992; Galvan *et al*., 1997). Onion, i.e., *A. cepa* is the most important crop grown in India for thousands of years. It is estimated to cover an area of 3,20,000 ha with a total production of 3.35 million tons working the average yield to 10.5t/ha (Pandita, 1994). On account of its being easily prone to numerous insects/ pests and fungal diseases especially downy mildew, late blight, anthracnose, purple blotch, and white rot the losses in the yield are quite severe. In the crop profile for onions in Texas (USA), the estimated yield loss in 2003 has reportedly been to the extent of 45% from Botrytis leaf blight and 65% from downy mildew. One feels compelled to ask if this is the situation of a developed nation what could be the status of developing ones like ours. Annual estimates for pesticide usage are to the tune of 1.56 pounds per acres (1, 184,700 acres treated) in California (www.pesticide info.org/). Using similar estimates for India where 790,736 acres of land are used for onion cultivation, 1,233,548.16 pounds of pesticide would be required to save the onion crop from diseases. This quantum will pose tremendous health and environmental issues. Alternative is to develop disease resistant varieties. For this, plant breeders can rely on wild species of *Allium*, for instance *A. roylei* and *A. fistulosum*.

Plants of *A. roylei* are locally used for their edible leaves, bulbs and dried inflorescences as a substitute of *A. cepa*. This is because all parts of the plant emit typical onion like odour. *A. roylei* though less explored and lesser known bears genes imparting resistance against various fungal diseases like downy mildew, late blight and anthracnose. Commonly known as jungle pyaz or gajna or panchali gajna, the species is found to be distributed in the Himalayan and sub-Himalayan ranges; Garhwal westwards between 6000-7000 ft. It is also found in the eastern Hindukush mountains of Pakistan and Afghanistan (Nasir, 1975). The species came into light when de Vries (de Vries, 1992) pointed out its importance in a Conference on Alliums, at Gatersleben, Germany. It is also reported as threatened and rare by various workers (Hajra, 1983; Walter and Gillet, 1998; Dar and Naqshi, 2001; Sharma and Gohil, 2008 and Pandey *et al*., 2008; Kohli and Gohil, 2009).

A. roylei has been considered as one of the most promising species for onion breeders (de Vries *et al*., 1992). Interspecific hybrids for *A. fistulosum* x *A. roylei* (Mc Collum, 1982) and *A. roylei* x *A. cepa* (Van deer Meer and de Vries, 1990) are on record. Authenticating extent of proximity between these species, these crosses enabled breeders to modify the genetic composition of some cultivated taxa. Valuable genes imparting resistance against downy mildew and leaf blight were successfully transferred from *A. roylei* to *A. cepa* (de Vries *et al*., 1992 and Scholten *et al*., 2007). Similarly anthracnose resistant gene, which is single and dominantly inherited, can also be transferred from *A. roylei* to *A. cepa* (Galvan *et al*., 1997). *A. fistulosum* constitutes another important species with higher dry matter content, are winter hardy and more pungent, flower earlier and have short flowering period than onion. Therefore, ample interest has been shown for successful introgression of genes from *A. fistulosum* to *A. cepa* also. Since direct crosses between the two could not be achieved, *A. roylei* was employed as a bridge species. Some of these agronomical traits including resistance to diseases such as onion leaf blight, pink root, anthracnose and to a pest like onion fly have been introgressed from *A. fistulosum* into *A. cepa* using this strategy (Khrustaleva and Kik, 2000). Interspecific crosses between *A. cepa* and *A. roylei* have yielded hybrids which are disease resistant (Simon, 2005). This has helped to eliminate the need of applying pesticides as partially or completely

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resistant cultivars have been obtained (Chuda and Adamus, 2009). Vu *et al* (2011, 2012) successfully produced novel alloplasmic male sterile lines in *A. cepa* harboring cytoplasm of *A. roylei*; and alien monosomic addition lines by introgression of genes from *A. roylei* into *A. cepa*. Interestingly, Scholten and his group, in Europe obtained hybrids which were completely resistant against downy mildew (Scholten *et al*., 2007).

All the breeding works mentioned above, were conducted on the Mussoorie germplasm (de Vries *et al*., 1992; Mc Collum, 1982 and Scholten *et al*., 2007) reportedly established at University of California, Davis (Mc Collum, 1982). Afterwards, de Vries also introduced few plants of the same during a conference on Alliums, at Gatersleben, Germany. We, at the University of Jammu have not been able to obtain this germplasm from Mussoorie inspite of some exploratory surveys conducted to procure the same. The populations worked out by the present workers so far from Bani, Mendhar and Gourwan regions of Jammu province (J&K) are complex translocation heterozygotes (Kohli, 2007,2013; Kohli and Gohil, 2009, 2011).

Nevertheless, nature has equipped these plants with an alternative means of survival. An individual plant has the potential to produce 4-5 new identical bulblets. Each bulblet forms a new plant on separation; if allowed to grow in undisturbed conditions. These plantlets survive well and grow into independent plants. Equipped with an efficient means of multiplication, the species can prove to be a good substitute for common onion during the periods of onion scarcity or of price hike. To ensure an effective utilization of this strategy and ensure availability of this following need to be implemented at the earliest:

1. Awareness among tribals residing in areas of occurrence about the importance of this species.
2. Utilization of wastelands at higher altitudes for its propagation since less maintenance is required.
3. Setting up of registered cooperative societies with members trained in cultivation, harvesting and post harvest management of the crop.

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