

SOLANUM MELONGENA L. AND WILD ALLIES: THE USEFUL POTENTIAL RESOURCE

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Both, wild and cultivated solanums, widely distributed throughout the tropical and subtropical regions of the world are of considerable agricultural and medicinal importance. The cultivars of *S. melongena* L.(eggplant), commonly called brinjal are not only cheap, popular and cash crops (rich in vitamins, minerals, starch, proteins and fibres) of South-East Asia, but they with their allies have also been reported to contain glycoalkaloids (solasodine), a good substitute to the currently employed steroidal sapogenin used in medicines for cardiovascular therapy, lipidopromotion, family planning, etc. Fruits and roots of certain wild solanum species are still traditionally used by tribals for the treatments of cold, fever, asthma and cough diseases of human as well as the foot and mouth diseases of cattle.

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The wild species of *Solanum melongena* L., widely distributed throughout the tropical and subtropical areas of the world are of paramount importance as medicinal plants due to their richness in alkaloid contents¹⁻³. These species possess several other desirable characters e.g. cluster bearing habit, profuse branching, disease and pest resistance and hardness to withstand draught conditions⁴. They also contain good amount of starch, soluble sugar and protein contents. These forms have been the source of origin of *Solanum melongena* cultivars now grown throughout the globe as important vegetable crop, especially for the common poor masses⁵⁻⁹. Several crosses between the cultivars and wild species, namely *S. incanum*, *S. indicum*, *S. torvum*, *S. sisymbriifolium*, *S. surratense*, *S. khasianum* and *S. integrifolium* were attempted by breeders in the past with a view to developing resistant varieties for combating the colossal loss to brinjal crop. Now-a-days, some workers are also engaged in developing interspecific somatic hybrids¹⁰ and somatic embryos¹¹ by tissue culture and biotechnological approaches.

Spinous *Solanums*, which enjoy world-wide distribution, constitute an important group of considerable economic

value. They have been in usage, both as vegetable and more particularly as plants of medicinal use¹²⁻¹⁴. *Solanum integrifolium* is one of the important wild species, which is resistant to little leaf¹⁵ and to the brinjal fruit borer. Hence, these species could be a good genetic resource for the breeding varieties of eggplant resistant to fruit borer causing severe damage to brinjal crop. *Solanum integrifolium* is about 31-33 cm high, with erect and spiny habit. Fruits show clusterous nature of 2-4 and tomato-like green colour when young, but on maturity they become red¹⁶. Likewise, *S. sisymbriifolium* is reported to be resistant to root knot nematode and to carmine spider mite. It is 95 to 160 cm high, viscous prickly woody, undershrub, with simple gland-tipped hairs; prickles long, straight, slender, yellow or somewhat chocolate in colour. Leaves long (20 x 10 cm), pinnatifid or 2 pinnatifid and prickly on both sides. Flowers are several in racemose order and white in colour. Fruits are green when young and red when ripe¹⁷. *S. torvum* was also reported to be resistant to *Verticillium*, *Fusarium* wilts, bacterial wilts and root knot nematodes¹⁸. The plant is about 150-280 cm in height, erect, aculeate, with shoot and hooked prickles. Inflorescence many (60-70); flowers sessile corymb or

umbellate cyme. *S. indicum* is another wild species of *S. melongena* which possesses desirable character viz., cluster bearing habit, profuse branching and hardness to withstand draught condition, These features have drawn attention of breeders to attempt hybridization using the said species. It is 95-160 cm high and is characterized by the thickly spiny and purplish green nature. Spines are often compressed, curved and short. Leaf size is variable and the clustered flowers are all of long styled nature. The inflorescence is 5-8 and the flower is a raceme. *S. incanum* or *S. insanum* have been identified as nearest allies of *S. melongena*¹⁹. *S. incanum* has been considered as a species²⁰ or variety of *S. melongena*²¹⁻²². *S. incanum* is suggested to be the progenitor of *S. melongena*. The high genomic similarity between them indicates their conspecific nature, though they possess extensive morphological diversity²³. *S. incanum* ranges from 75-90 cm in height and it is erect and spiny in habit, The inflorescence contains solitary flower. Its crossability relationship with *S. melongena* cultivars showed fair degree of compatibility. This species, therefore, is more suited for developing resistant varieties of *S. melongena* cultivars for increasing the productivity of brinjal. *S. surratense*, one of the most important wild species has great medicinal value. It is spiny and prostrate in nature. The inflorescence is solitary²⁴⁻²⁵. Likewise, *S. khasianum* contains good amount of alkaloids. Another alkaloid like saponin was obtained from *S. khasianum*²⁶. It is 60-75 cm in height and glandular villous thorny shrub or undershrub, with spreading habit. The inflorescence occurs in cluster of 3-5 flowers. Berries are green when young and yellow after maturity. Another wild species *S. dulcamara* contains three main steroidal alkaloids-tomatidenol, solasodine and soladulcidine, which occurs in varying proportions in many glycosides²⁷. The wild allies contain

appreciable amounts of solasodine in different plant parts, such as root, leaf, fruits etc. Solasodine, a steroidal alkaloid assumes paramount importance as it constitutes a significant group of therapeutic agents employed in the treatment of inflammatory disorders, libido promotion, sex hormone imbalances and as oral contraceptive for fertility control measures²⁸⁻³⁰. Fruits and roots of certain wild species are traditionally used by tribals for the treatment of cold, fever, asthma and cough disease of human as well as foot and mouth diseases of cattle.

Several varieties have been generated from wild species which are presently taken as vegetable and pickles. The wild species of *S. melongena* are the only source of brinjal cultivars. Brinjal cultivars, with higher fruit yield also possess high nutritive value; analysis have shown the fresh weight composition of fruits to be 92.7% moisture, 1.4% protein, 0.3% fat, 4% carbohydrates, 0.3% minerals and 1.3% fibre. The mineral constituents present as mg/100 gm edible matter are: calcium 18, manganese 16, phosphorus 47, iron 0.9, sodium 3, potassium 200, copper 17, sulphur 49 and chlorine 52 together with the trace amounts of manganese and iodine. The vitamins present are thiamine 0.04 mg, riboflavin 0.11 mg, nicotinic acid 0.9 mg, vitamin C 12 mg, and chlorine 52 mg per 100 gm of edible matter³¹⁻³². The eggplant fruits are quite rich in fibre and mineral, the two important components of human diet³³. Biochemical constituents of the eggplant have been studied by several workers³⁴⁻⁴⁰ to apprise off the breeders and consumers about the nutritive value of the crop. The fruit colour of the eggplant varies from white to purple, the latter being more common and of consumer choice. Though, according to Ayurvedic system, the white varieties are said to be good for patients suffering from diabetes. Roots of eggplant are credited with

antiasthmatic properties. The juice is employed to cure otitis and toothache. Leaves are said to possess necrotic properties used in cholera, bronchitis, dysuria and asthma. Extracts of the plants inhibit the growth and development of several types of bacteria; the pulp of fruit is more effective than juice. The eggplant is reported to promote intrahepatic metabolism of cholesterol. Both, leaf and fruits, fresh or dry produce a marked drop in blood cholesterol level. The decholesteroling effect is attributed to the presence of Mg and K salts in the tissue of the plant. All these suggest the desirability of further investigation of the medicinal properties and popularisation of *Solanum* plants as vegetable and therapeutic source.

Several crosses were attempted by the breeders between wild species and the cultivars⁴¹⁻⁴⁷. But, unfortunately, the crosses between wild species (*S. torvum*, *S. sisymbriifolium*, *S. khasianum*) and the cultivars proved unsuccessful, seemingly due to genetic incapability. Successful crosses, however, between *S. indicum* and *S. incanum* were also reported⁴⁸⁻⁴⁹. It, thus, becomes apparent that these two wild species can be potentially used to develop disease and draught resistant varieties. However, the characters involving resistance and ecological tolerance can possibly be introduced into the cultivated lines through hybridization with wild germplasms. The intervarietal crosses in eggplants are positive regarding heterosis in economic characters such as earliness of production and yield⁵⁰⁻⁵².

The availability of advanced biotechnology from *in vitro* tissue culture to DNA manipulation (somatic embryogenesis, androgenesis, somatic fusion and genetic transformation) could be applied to eggplant breeding in order to overcome sexual barriers as well as to shorten the time necessary for generating new varieties through conventional breeding procedures⁵³⁻⁵⁴. Thus, the near future

is hoped to witness significant strides of modern biotechnological approaches in the transfer of beneficial characters from wild species to the cultivars (in sexually incompatible strains) through gene manipulation methods, which otherwise is not possible by conventional breeding procedures⁵⁵⁻⁵⁶. In spite of the modern biotechnology the conventional methods, however, are more stable and long lasting. In view of inherent potentialities in the wild as well as cultivated varieties of *S. melongena* urgent need for the conservation of existing genotypes becomes apparent.

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