Utilization of Exotic Germplasm for the Development of Groundnut Varieties

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To meet the food requirement of increasing population it is necessary to increase the agricultural pr oduction in food grains, oilseeds and agricultural production. As the potential for area expansion is limited, development and use of new varieties of seed and ensuring their availability to farmers are of crucial importance to increase production. Groundnut (*Arachis hypogaea* L.) is an important oilseed crop of tropical and subtropical areas of the world. India is the leading groundnut producing country with about 35 % of world's groundnut area and about 27 % production (second to China). It is a primary source of edible oil and with high protein content (Rajgopal *et al.*, 2002). Groundnut originated in the southern Bolivia/ north west Argentina region in South America and is presently cultivated in 108 countries of the world. Important groundnut producing countries are China, India, Indonesia, Myanmar, Thailand, and Vietnam in Asia; Nigeria, Senegal, Sudan, Zaire, Chad, Uganda, Ivory Coast, Mali, Burkina Faso, Guinea, Mozambique, and Cameroon in Africa; Argentina, Brazil, USA and Mexico (Bandhopadhyay *et al.*, 2003).

To promote the effective utilization of Plant Genetic Resources, National Bureau of Plant Genetic Resources (NBPGR) is actively engaged in importing the important germplasm of various crops from different countries, which has resulted in introduction of a large number of oilseed germplasm since 1943. In addition NBPGR has made considerable efforts in facilitating the free flow and exchange of germplasm to strengthen the National Crop Improvement Programmes. Germplasm introduced in India comprising cultivated, elite lines, breeding lines, wild species and commercial varieties have played a significant role in the development of varieties and hybrids in oilseed crops and figure prominently in the list of promising material, original source material and parental lines of improved cultivars (Dhillon *et.al.*, 2004) The National Genebank at NBPGR holds, 7,283 accessions of exotic oil seed crop germplasm in the long term storage facility comprising of groundnut (1,480), rapeseed-mustard (294), safflower (2,727), sunflower (636), soybean (1,559), castor (326), linseed (104), niger (11) and sesame (146). This in turn has resulted in release of a number of new varieties as a direct selection/ collection or through hybridization. Most of the varieties contain constellations of useful genes, which can be further appraised to meet the requirement of changing scenario by utilizing the potentially valuable genes. Development of high yielding cultivars of desired duration with resistance/ tolerance to single or multiple stresses and developing stress management strategies are the main objectives of groundnut improvement programmes worldwide.

A total of 158 varieties of groundnut have been released so far either through All India Coordinated Research Project, State Agricultural Universities or State Agriculture Department since 1905 to 2004. Out of the 158 Groundnut cultivars released for cultivation in India, the early cultivars are all selection from exotic material (Table 1). They are direct selections, introductions or mutants. Some of the exotic introductions were used as one/ both parents. Some of the released cultivars have been used repetitively for the development of new improved varieties for example of the total cultivars, 15 cultivars had Robut 33-1 as one of the parents. Cultivar JL-24 contributed to the development of ten and M 13 was directly or indirectly involved in development of the seven (Table 2). GAUG 10 and TMV 10 in turn is a natural mutant of cultivar Argentine that is also used as a parent in development of another Cultivar. TG-1 and TG-2 are natural mutants whereas cultivar UF 70-103 is a direct

Table 1. Exotic germplasm used Indirectly for varietal development in groundnut (Hybridization)

S.No.	Cultivar Used	Varieties developed
1	M-13	B-95, BAU-13, Birsa Bold, GG-11, M-335, TAG-24, Somnath
2	Robut 33-1	BSRG-1, DRG-17, GG-20, HNG-10, ICGS-1, ICGS-11, ICGS-37, ICGS-44, ICGS-5, Kadiri-3, RG-141, TG-22, VRI-1, VRI-3
3	JL-24	AK-159, GG-3, GG-5, JGN-3, K-134, Kadiri-5, Narayani, Sneha, Snigdha, Tirupati-4, VRI-2

Table 2. Exotic germplasm used directly for varietal development in groundnut (Selection)

S.No	Cultivar Used	Varieties developed
1	RS-144	Dh-8
2	Robut 33-1	ICGS-1, ICGS-11, ICGS-37, ICGS-44, VRI-1,Kadiri-3
3	EC 94943	JL-24
4	Exotic 9	Jyoti
5	MK 374	Kadiri-2
6	T-28	Kaushal
7	EC 16664	MA-16
8	NC-13	M-13
9	Maldiyan Bunch	Polachi-1
10	Brazillian Culture	RS-138, RSB-87
11	ICGS-1	SG-84
12	EC1664	T-64
13	Tennse white	TMV-7,
14	ICGV-86011	ALR-2
15	TGS-2	TAG-24
16	EC 106983/3-1	Tirupati-1
17	Ugandian Culture	TMV-12
18	Gudiyatham bunch	TMV-2
19	Basse	TMV-3
20	North carolina	TMV-4
21	East Africa	TMV-11
22	Virgenia bunch	TMV-6
23	Spanish mutant-1	RSHY-1

Table 3. Varietal Development by mutation/direct introduction of exotic cultivars

S.No	Cultivar Used	Varieties developed
1	Natural mutant from Argentine	TMV-10
2	X-ray mutant of Spanish Improved	TG-1
3	Mutant of Spanish Improved	TG-3
4	Introduction from USA	UF-70-103

introduction from USA (Table 3). Further more than 30 original genotypes have gone into pedigree of the hybridization derived cultivars as one of the parents.

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Genetic Variability in Exotic Germplasm of *Crambe abyssinica*

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The genus *Crambe*, consisting of 20 different species of herbaceous annuals is a member of family Cruciferae, tribe Brassicae. Crambe (*Crambe abyssinica* Hochst Ex. RE Fries) is a lesser-known oilseed crop, closely related to rapeseed-mustard. It is a potential source of industrial oil, because of its erucic acid (55-64%) rich seed-oil. Members of this genus have been under cultivation in Europe, Africa, Near East and West Asia and North and South America (Lessman and Meier, 1972). Crambe is cultivated during cooler season, which can tolerate low temperature up to -5^0C (Hirsinger, 1989). It is an erect, herbaceous annual and stem is stiff, covered with fine, short hairs. The main stem branches close to the ground to form secondary branches. Leaves are glabrous and basically ovate/lyrate. The time of flowering depends upon rainfall and temperature. The inflorescence is a cyme, which with progressive growth become long and indeterminate flowering panicle with racemes of white flowers. The typical cruciferous flowers have four white petals of about 3 mm length and six stamens, producing a small, brownish seed on each flower. Each seed is contained in a papery thin pod. Fruit is a capsule (siliqua), initially pale green but turn yellowish on maturity. Each capsule contains a single spherical brown seed. Although capsules usually have two embryos initially, only one develops into mature seed. The fruit is composed of approx. 40 per cent pericarp, 4 per cent testa, 6 per cent hypocotyl and 50 per cent cotyledons.

Crambe oil, due to good stability at high temperature, is very well suited as lubricant for steel casting. Derivatives of erucic acid can be used for various chemical applications such as slip agents, plasticizers, lubricants, softeners, anti-foamers, fixatives in perfumes etc. The seed oil of *Crambe abyssinica* has unparallel diversity of fatty acid patterns that range from C_8-C_{18} with medium chain triglycerides (C_8-C_{14}) predominating, which is unique in plant kingdom.