

Germplasm Introduction of Underutilized and New Crops

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The region of South Asia is very diverse in its physiology, agro-ecology and climate, and possesses rich diversity in cultivated crops. Several under-exploited and underutilized species occur which include native diversity and also, well acclimatized species introduced particularly in the past few decades. In India, a total of 25,077 accessions of over 60 underutilized and new crops have been introduced since independence. Out of these, 3,361 accessions of 21 underutilized plants have been evaluated under the aegis of All India Coordinated Research Project on Underutilized Crops, which led to identification of 395 promising lines. Some of these materials, have been very useful as food and industrial crops and through germplasm evaluation several promising varieties have been released for cultivation at national level. To mention among them are Suvarna in amaranth, Himpriya in buckwheat, BRS 1 in rice bean, VH 82-1 in faba bean, Arizona-2 in guayule and EC 33198 in jojoba. These are now well adapted to diverse agro-ecosystems/agricultural systems. Further, about 70 species of underutilized crops have been identified to have promise in Asia-Pacific region and can play a pivotal role in diversification of the agriculture, management of wastelands and meeting the nutritional requirements of the people.

Similar diversity of known potential has been documented for other centres of diversity of crop plants, so as to introduce germplasm from the respective mega diversity regions and evaluate these for their adaptation and usefulness in South Asia region. In this paper, which is based on work carried out by NBPGR and other centres in India, an attempt has been made to assess the impact of such diversity and the opportunities envisaged through further exotic introductions.

Key words: Germplasm introduction, Underutilized crops, New crops, Diversity

South Asia, comprising the countries Bangladesh, Bhutan, India, Maldives, Nepal, Pakistan and Sri Lanka is situated between Equator and 40°N latitude. The region has altitudinal variations from sea level to more than 3500 masl and exhibits extreme diversity for edapho-climatic conditions, agro-climatic regions and ecosystems. The Hindustani Gene Centre, one of the twelve Vavilovian centres of biodiversity, is located in South Asia and possesses a rich diversity of over 17,000 species of higher plants occurring in 16 vegetation types (Ramachandran *et al.*, 1986). Apart from India, countries such as Nepal, Bhutan and Sri Lanka also have rich agro-biodiversity.

It is estimated that 82 per cent of total land area in South Asia suffers from one or the other kind of stress (drought – 43%, mineral stress – 5%, shallow soil depth 23% and excess water – 11%) and only 18 per cent area is free from any serious limitation (Dent, 1980). Decreasing availability of land for agriculture, due to diversion of land for industrial use, urbanization, etc. has led to more dependence on degraded lands to meet the increasing requirements of food, fodder, fibre, firewood and timber during the 21st century. The sustainability of intensive agriculture in such areas is circumspect. Therefore, underutilized crops, which are adapted to stressed environments and provide food and

nutritional cover to about 10 per cent population inhabiting remote, tribal and backward areas, offer scope for diversification of agriculture. About 70 species of underutilized crops have been identified to have promise in the Asia Pacific region (Eyzaguirre *et al.*, 1999; Arora, 2002).

Apart from the domestically available diversity of plants, there is a lot of scope of further enrichment of agro-biodiversity through introduction of suitable species from similar environments. In India, 25,077 accessions of over 60 underutilized/new crops have been introduced during the last fifty years (Table 1). Out of these, 3,361 germplasm lines of 21 crops were evaluated under the aegis of All India Coordinated Research Project (now Network) on Underutilized Crops, which led to identification of 395 promising lines and release of several varieties for cultivation. In this paper, an attempt has been made to review the performance of introductions of underutilized and new crops and to enlist the potential plant species suitable for introduction in South Asia.

Amaranth (*Amaranthus* spp.)

Amaranth is a crop with multiple uses and has a potential for usage as grain, vegetable and fodder. Its grains have high protein content with high lysine and balanced

Table 1. Germplasm introductions of underutilized and new crops

| Genus | Common name | Total no. accs. | Sources | Species introduced |
|-------------------|-------------|-----------------|---|---|
| <i>Acacia</i> | Babool | 636 | Argentina(1), Australia(519), Belgium (1), Denmark (7), Egypt (1), Ethiopia (6), France (14), Indonesia (2), Japan (3), Pakistan (2), Philippines (2), Sabauerde Islands (1), Senegal (5), Syria (1), Thailand (1), UK (55), Uruguay (1), USA (9), Zambia (1), Unknown (4) | <i>A. acinacea</i> , <i>A. acradenia</i> , <i>A. acuminata</i> , <i>A. adsurgens</i> , <i>A. adunca</i> , <i>A. albida</i> , <i>A. alleniana</i> , <i>A. ammobia</i> , <i>A. ampliceps</i> , <i>A. ancistrocarpa</i> , <i>A. aneura</i> , <i>A. angutissima</i> , <i>A. aphanoclada</i> , <i>A. aphylla</i> , <i>A. araneosa</i> , <i>A. arepta</i> , <i>A. argyraea</i> , <i>A. argyrophylla</i> , <i>A. armata</i> , <i>A. atkinsiana</i> , <i>A. aueura</i> , <i>A. aulacocarpa</i> , <i>A. auricoma</i> , <i>A. auriculiformis</i> , <i>A. baileyana</i> , <i>A. bancroftii</i> , <i>A. beauverdiana</i> , <i>A. bidwillii</i> , <i>A. binervata</i> , <i>A. bivenosa</i> , <i>A. blakei</i> , <i>A. blayana</i> , <i>A. brachystachya</i> , <i>A. brassii</i> , <i>A. brivenosa</i> , <i>A. brochystachya</i> , <i>A. brownii</i> , <i>A. burkittii</i> , <i>A. burrowii</i> , <i>A. buxifolia</i> , <i>A. calamifolia</i> , <i>A. calcicola</i> , <i>A. cambagei</i> , <i>A. cardiophylla</i> , <i>A. caven</i> , <i>A. cheelii</i> , <i>A. chinchillaensis</i> , <i>A. chisholmii</i> , <i>A. chrysotricha</i> , <i>A. cincinnata</i> , <i>A. citrinoviridis</i> , <i>A. clerosperma x ligulata</i> , <i>A. colei</i> , <i>A. colletioides</i> , <i>A. comferta</i> , <i>A. complanata</i> , <i>A. concurrens</i> , <i>A. confusa</i> , <i>A. confusa merril</i> , <i>A. continua</i> , <i>A. coolgardiensis</i> , <i>A. coriacea</i> , <i>A. coriacea var. coriacea</i> , <i>A. cowleana</i> , <i>A. crassicarpa</i> , <i>A. cultriformis</i> , <i>A. cyanophylla</i> , <i>A. cyclops</i> , <i>A. dealbeta</i> , <i>A. deamii</i> , <i>A. dicyophleba</i> , <i>A. diffcilis</i> , <i>A. diffusa</i> , <i>A. elata</i> , <i>A. eptocarpa</i> , <i>A. estrophiolata</i> , <i>A. extensa</i> , <i>A. farneciana</i> , <i>A. fimbriata</i> , <i>A. flavescans</i> , <i>A. fleckeri</i> , <i>A. floribunda</i> , <i>A. frigescens</i> , <i>A. gennerae</i> , <i>A. gladiiformis</i> , <i>A. hateroclitia</i> , <i>A. hemignosta</i> , <i>A. heterochita</i> , <i>A. holosericea</i> , <i>A. hylonoma</i> , <i>A. implexa</i> , <i>A. iteaphylla</i> , <i>A. ixiophylla</i> , <i>A. juncifolia</i> , <i>A. kempeana</i> , <i>A. laccata</i> , <i>A. latzii</i> , <i>A. leptocarpa</i> , <i>A. ligulata</i> , <i>A. longifolia</i> , <i>A. lopicarpa</i> , <i>A. lysiphloia</i> , <i>A. macronochieana</i> , <i>A. mangium</i> , <i>A. mearnsii</i> , <i>A. melanoxylon</i> , <i>A. moconochieana</i> , <i>A. mollissima</i> , <i>A. muelleriana</i> , <i>A. murrayana</i> , <i>A. myrtifolia</i> , <i>A. neriifolia</i> , <i>A. notabilis</i> , <i>A. oswaldii</i> , <i>A. pachycarpa</i> , <i>A. paradoxa</i> , <i>A. pennatula</i> , <i>A. penninervis</i> , <i>A. peregrina</i> , <i>A. podalryiaefolia</i> , <i>A. polystachya</i> , <i>A. pravissima</i> , <i>A. pulchella</i> , <i>A. pycnantha</i> , <i>A. pyonduthagii</i> , <i>A. querculiformis</i> , <i>A. ramosissima</i> , <i>A. ratinodes</i> , <i>A. rhetinocarpa</i> , <i>A. rotundifolia</i> , <i>A. rupicola</i> , <i>A. saligna</i> , <i>A. satigna</i> , <i>A. savveolens</i> , <i>A. sclerosperma</i> , <i>A. sclerosperma x ligulata</i> , <i>A. semilunata</i> , <i>A. senegal</i> , <i>A. seyal</i> , <i>A. shirleyi</i> , <i>A. silvestris</i> , <i>A. simsii</i> , <i>A. spectabilis</i> , <i>A. steedmanii</i> , <i>A. stenophylla</i> , <i>A. stipuligera</i> , <i>A. stowardii</i> , <i>A. striatifolia</i> , <i>A. strieta</i> , <i>A. subporosa</i> , <i>A. tortlis ssp. spirocarpo</i> , <i>A. trinervis</i> , <i>A. trineura</i> , <i>A. tumida</i> , <i>A. urophylla</i> , <i>A. validinervia</i> , <i>A. victoriae</i> , <i>A. victorial</i> , <i>A. penninervis</i> |
| <i>Actinidia</i> | Kiwi fruit | 34 | Australia (5), Italy (1), Japan (2), New Zealand (10), USA (14), USSR (2) | <i>A. arguta</i> , <i>A. callosa</i> , <i>A. chinensis</i> , <i>A. delocosa</i> , <i>A. fairchild</i> , <i>A. kolomicta</i> , <i>A. olomitka</i> , <i>A. michurins</i> , <i>A. polygama</i> , <i>A. rufa plancli</i> |
| <i>Amaranthus</i> | Chaulai | 889 | Argentina (3), Australia (5), Bangladesh (14), Benin (1), Botswana (2), Cameroon (2), Canada (1), China (9), Costa Rica (1), Denmark (1), France (6), Germany (11), Guatemala (1), Hong Kong (6), Hungary (5), Italy (7), Japan (5), Kenya (35), Latvia (1), Nepal (8), Netherlands (20), Nigeria (48), Philippines (1), Poland (8), Russia (60), Syria (15), Taiwan (102), UK (3), USA (485), USSR (4), Yugoslavia (6), Unknown (13) | <i>A. acutilobus</i> , <i>A. adulis</i> , <i>A. albus</i> , <i>A. aurens</i> , <i>A. australis</i> , <i>A. blitoides</i> , <i>A. blitum</i> , <i>A. spinosus</i> , <i>A. tricolor</i> , <i>A. bouchoni</i> , <i>A. cannabinus</i> , <i>A. caudatus</i> , <i>A. celosia</i> , <i>A. chorostachys</i> , <i>A. crassipes</i> , <i>A. crispus</i> , <i>A. cruentus</i> , <i>A. dubius</i> , <i>A. spinosus</i> , <i>A. tricolor</i> , <i>A. deflexus</i> , <i>A. fimbriatus</i> , <i>A. flavus</i> , <i>A. floridanus</i> , <i>A. gangeticus</i> , <i>A. gangiticus var. re-del fuoco</i> , <i>A. graecizans</i> , <i>A. hypochondriacus</i> , <i>A. eucocarpus</i> , <i>A. mangostanum</i> , <i>A. mante gaziannus</i> , <i>A. melancolicus</i> , <i>A. palmeri</i> , <i>A. panicular</i> , <i>A. paniculatus</i> , <i>A. powellii</i> , <i>A. pumilus</i> , <i>A. quitensis</i> , <i>A. retroflexus</i> , <i>A. rudes</i> , <i>A. sanguinens</i> , <i>A. silvestris</i> , <i>A. spinosus</i> , <i>A. tataneum</i> , <i>A. tricolor</i> , <i>A. viridis</i> |
| <i>Asimina</i> | Paw-paw | 6 | USA (5), USSR (1) | <i>A. triloba</i> |

(Contd.)

| Genus | Common name | Total no. accs. | Sources | Species introduced |
|---------------------|-----------------|-----------------|---|---|
| <i>Atriplex</i> | Salt bush | 256 | Australia (87), Chile (2), France (8), Germany (17), Hungary (7), Israel (6), Italy (3), Japan (1), Morocco (2), Poland (2), Spain (1), Sweden (3), Tunisia (3), USA (97), USSR (5), Yugoslavia (1), Unknown (17) | <i>A. angulatum</i> , <i>A. atacamensis</i> , <i>A. breweri</i> , <i>A. bunbunlana</i> , <i>A. calotheca</i> , <i>A. calothecus</i> , <i>A. canescens</i> , <i>A. halimus</i> , <i>A. hortensis</i> , <i>A. inflata</i> , <i>A. lentiformis</i> , <i>A. leptocarpa</i> , <i>A. leucoclada</i> , <i>A. muelleri</i> , <i>A. nitens</i> , <i>A. rosea</i> , <i>A. semibaccata</i> , <i>A. spongiosa</i> , <i>A. suberecta</i> , <i>A. amanicola</i> , <i>A. campanulatum</i> , <i>A. canescens</i> , <i>A. chereia</i> , <i>A. fissivalvis</i> , <i>A. glabriuscula edmondston</i> , <i>A. glauca</i> var. <i>rotundifolia</i> , <i>A. halimoides</i> , <i>A. halimus</i> , <i>A. hastata</i> , <i>A. holocarpa</i> , <i>A. hortensis</i> , <i>A. hortensis</i> , <i>A. hortensis</i> l.v. <i>atropuryurea</i> hot., <i>A. hortensis</i> l.v. <i>purpurea</i> a hort., <i>A. hortensis</i> linn., <i>A. hortensis</i> rcberrina, <i>A. hortensis</i> var. <i>lutea</i> , <i>A. hostansis</i> var. <i>rubes</i> , <i>A. inflata</i> , <i>A. isatidea</i> , <i>A. laciniatum</i> , <i>A. latifolia</i> wg., <i>A. lentiformis</i> , <i>A. leptocarpa</i> , <i>A. leptocarpum</i> , <i>A. leptocarpa</i> , <i>A. leucoclada</i> , <i>A. lindleyi</i> , <i>A. litrolis</i> , <i>A. maritima</i> , <i>A. nitens</i> , <i>A. nitens schkuhr</i> , <i>A. nitens</i> , <i>A. nummularia</i> , <i>A. oblongifolia</i> , <i>A. paludosa</i> , <i>A. patula</i> , <i>A. patulus</i> , <i>A. prostrata</i> , <i>A. pseudo campanulatum</i> , <i>A. raghodioides</i> , <i>A. semibaccata</i> , <i>A. spongiosum</i> , <i>A. undulata</i> , <i>A. vesicaria</i> , <i>A. leutiformis</i> |
| <i>Atylosia</i> | | 90 | Australia (41), Hong Kong (1), Italy (3), Malawi (2), Mali (1), Nepal (1), Netherlands (1), Nigeria (1), Sri Lanka (17), Sweden (1), Thailand (12), UK (1), Unknown (8) | <i>A. acutifolia</i> , <i>A. grandifolia</i> , <i>A. marmorata</i> , <i>A. platysepala</i> , <i>A. pluriflora</i> , <i>A. scaraboides</i> , <i>A. serica</i> , <i>A. viscida</i> |
| <i>Avena</i> | Oats | 2,362 | Australia (112), Austria (3), Belgium (4), Brazil (100), Canada (231), Cyprus (2), Czechoslovakia (12), Denmark (8), Ecuador (1), Ethiopia (1), Finland (26), France (9), Germany (12), Greece (1), Holland (25), Hungary (156), Israel (4), Italy (22), Japan (9), Kenya (9), Mexico (15), Mongolia (6), Nepal (8), New Zealand (4), Norway (2), Portugal (13), Russia (6), South America (2), Sweden (50), Switzerland (1), Taiwan (3), Turkey (7), UK (92), USA (1252), USSR (135), Yugoslavia (13), Unknown (8) | <i>A. sativa</i> |
| <i>Bambusa</i> | Bamboo | 1 | Japan (1) | - |
| <i>Brachychiton</i> | | 1 | Australia (1) | <i>B. populaneus</i> |
| <i>Carya</i> | Pecan nut | 137 | Argentina (1), Germany (12), USA (123), USSR (1) | <i>C. illinoensis</i> |
| <i>Cassia</i> | | 1 | Australia (1) | <i>C. struttii</i> |
| <i>Casuarina</i> | Horse tail tree | 25 | Australia (62), Cuba (1), Cyprus (1), France (1), Philippines (2), Tanzania (2), UAR (1), UK (1), USA (11), Unknown (3) | <i>C. equisetifolia</i> |
| <i>Chenopodium</i> | Chenopods | 285 | | <i>C. ambrosioides</i> , <i>C. berlandieri</i> subsp. <i>nutalliae</i> , <i>C. capitatum</i> , <i>C. giganteum</i> , <i>C. pallidicaule</i> , <i>C. quinoa</i> , <i>C. album</i> , <i>C. amaranticolor</i> , <i>C. amaranthicolor</i> , <i>C. amaranticular</i> , <i>C. ambrosides</i> , <i>C. anthelminticum</i> , <i>C. anthelmintica</i> , <i>C. aristatum</i> , <i>C. auricomum</i> , <i>C. berlandieri</i> , <i>C. bonus</i> , <i>C. bonus henricu</i> , <i>C. bonus henricus</i> , <i>C. bonus-henricus</i> , <i>C. canihua</i> , <i>C. capitatum</i> , <i>C. ficifolium</i> , <i>C. giganteum</i> , <i>C. glauam</i> , <i>C. quinoa</i> , <i>C. hybridum</i> , <i>C. murale</i> , <i>C. nutalliac</i> , <i>C. pallidicaule</i> , <i>C. pallidicaulle</i> , <i>C. pallidicaula</i> , <i>C. polyspermum</i> , <i>C. quinoa wild</i> , <i>C. quiroa</i> , <i>C. quoinoa</i> , <i>C. schraderanum</i> , <i>C. vulvaria</i> , <i>C. bonus-hernriens</i> , <i>C. capitatum</i> , <i>C. foliosum</i> , <i>C. giganteum</i> , <i>C. alba</i> |
| <i>Coix</i> | Job's tear | 17 | Brazil (2), Burma (1), Costa Rica (1), Germany (1), Japan (5), Nepal (1), Sri Lanka (1), Switzerland (1), UK (1), USA (3) | <i>Coix lachryma - jobi</i> |

| Genus | Common name | Total no. accs. | Sources | Species introduced |
|--------------------|------------------------|-----------------|---|--|
| <i>Citrullus</i> | Bitter apple /Tinda | 12 | Australia (1), Canada (1), Switzerland (1), USA (9) | <i>C. colocynthis</i> |
| <i>Citrullus</i> | Water | 524 | Argentina (1), China (13), Denmark (3), Egypt (3), Germany (13), Holland (1), Iran (1), Russia (10), Taiwan (17), UAR (1), UK (1), USA (422), USSR (37), Uzbekistan (1) | <i>Citrullus lanatus</i> var. <i>caffer</i> , <i>Citrullus lanatus</i> var. <i>vulgaris</i> , <i>Citrullus lanatus</i> var. <i>citroides</i> , <i>Citrullus lanatus</i> var. <i>lanatus</i> , <i>Citrullus lanatus</i> ssp. <i>cordaphan</i> |
| <i>Cucurbita</i> | Buffalo/ Wild gourd | 57 | Lebanon (7), Mexico (1), USA (48), Unknown (1) | <i>C. foetidissima</i> |
| <i>Cuphea</i> spp. | Cuphea | 267 | USA (264), West Germany (3) | <i>C. aequipetala</i> , <i>C. carthagenensis</i> , <i>C. glutinosa</i> , <i>C. hookeriana</i> , <i>C. hybrid</i> , <i>C. laminulifers</i> , <i>C. lanceolata</i> , <i>C. lutea</i> , <i>C. painteri</i> , <i>C. procumbens</i> , <i>C. tolucaana</i> , <i>C. viscosissima</i> , <i>C. wrightii</i> |
| <i>Cyphomandra</i> | Tree tomato | 9 | Bulgaria (1), East Africa (1), France (1), Spain (2), UK (2), Venezuela (1), Unknown (1) | <i>C. betacea</i> , <i>C. crassifolia</i> , <i>C. letacea</i> , <i>C. naranjilla</i> |
| <i>Diospyros</i> | Persimmon | 23 | Australia (2), Romania (1), USA (12), USSR (4), Unknown (4) | <i>D. dignya</i> , <i>D. kaki</i> , <i>D. lotus</i> , <i>D. virginiana</i> |
| <i>Durio</i> | Durian | 2 | Malaysia (1), Srilanka (1) | <i>D. zibenthinus</i> |
| <i>Elaeis</i> | Oil palm | 153 | Belgium (25), Cameroon (18), Canada (2), Costa Rica (71), Malaysia (2), Nigeria (3), Philippines (1), Sierra Leone (1), Singapore (8), Tanzania (11), Zambia (9) | <i>E. guineensis</i> |
| <i>Enterpe</i> | Enterpe | 1 | UK (1) | <i>E. globosa</i> |
| <i>Elymus</i> | Russian wild rye grass | 371 | Australia (8), Canada (14), France (2), Germany (1), Japan (1), Sweden (5), USA (331), USSR (4), West Germany (3), Unknown (2) | <i>E. agropyroides</i> , <i>E. alatavicus</i> , <i>E. ametinii</i> , <i>E. angustus</i> , <i>E. antarcticus</i> , <i>E. antiquus</i> , <i>E. aolinii</i> , <i>E. arenarius</i> , <i>E. aristiglumis</i> , <i>E. atrtus</i> , <i>E. austroromontanus</i> , <i>E. bakeri</i> , <i>E. barbicallus</i> , <i>E. batalinii</i> , <i>E. brachyaristatus</i> , <i>E. breviaristatus</i> , <i>E. breviaristatus</i> subsp. <i>Scabrifolius</i> , <i>E. canadensis</i> , var. <i>canadensis</i> , <i>E. caninus</i> , <i>E. caucasicus</i> , <i>E. ciliaris</i> , <i>E. ciliaris</i> subsp. <i>amurensis</i> , <i>E. cinerens</i> , <i>E. confuses</i> , <i>E. curvatus</i> , <i>E. dahuricus</i> , <i>E. dahuricus</i> subsp. <i>excelsus</i> , <i>E. dentatus</i> , <i>E. drobovfi</i> , <i>E. elymoides</i> , <i>E. elymoides</i> subsp. <i>brevifolius</i> , <i>E. elymoides</i> subsp. <i>californicus</i> , <i>E. elymoides</i> subsp. <i>elymoides</i> , <i>E. europoens</i> , <i>E. fedtschenkoi</i> , <i>E. fibrosus</i> , <i>E. funceus</i> , <i>E. gigantens</i> , <i>E. glaucissimus</i> , <i>E. glaucus</i> , <i>E. gmelinii</i> , <i>E. grandighumis</i> , <i>E. haffmannii</i> , <i>E. hystrix</i> , <i>E. interruptus</i> , <i>E. junceus</i> , <i>E. kengii</i> , <i>E. kirkii</i> , <i>E. kokonoricus</i> , <i>E. lanceolatus</i> , <i>E. laxiflorus</i> , <i>E. longearistatus</i> , <i>E. macrourus</i> , <i>E. magellanicus</i> , <i>E. mallis</i> , <i>E. melantherus</i> , <i>E. millosus</i> , <i>E. mollis</i> trin, <i>E. multicaulis</i> , <i>E. multisetus</i> , <i>E. mutabilis</i> , <i>E. mutabilis oschensis</i> , <i>E. mutabilis</i> sub sp. <i>paecaespitousus</i> , <i>E. mutabilis</i> var. <i>oschensis</i> , <i>E. nevskii</i> , <i>E. nipponicus</i> , <i>E. nutans</i> , <i>E. panormitanus</i> , <i>E. parishfi-laeve</i> , <i>E. parishii</i> , <i>E. patagonicus</i> , <i>E. pendulinus</i> , <i>E. praeruptus</i> , <i>E. pseudonutans</i> , <i>E. purpuraristatus</i> , <i>E. rectisetus</i> , <i>E. retusus</i> , <i>E. rigidulus</i> , <i>E. scaber</i> , <i>E. scaber</i> var. <i>parviflorus</i> , <i>E. scaber</i> var. <i>scaber</i> , <i>E. scabrifolius</i> , <i>E. scabriglumis</i> , <i>E. scabrous</i> , <i>E. scabrus</i> var. <i>scabrous</i> , <i>E. scribneri</i> , <i>E. semicostatus</i> , <i>E. semicostatus</i> , <i>E. sibiricus</i> , <i>E. nevski</i> , <i>E. sinicus</i> , <i>E. stenachyrus</i> , <i>E. stenostachyus</i> , <i>E. strictus</i> , <i>E. submuticus</i> , <i>E. subsecundus</i> , <i>E. tenuis</i> , <i>E. tilcarensis</i> , <i>E. trachycaulus</i> , <i>E. trachycaulus</i> subsp. <i>subsecundus</i> , <i>E. transhyrcanus</i> , <i>E. triticoides</i> , <i>E. tschimganicus</i> , <i>E. tsukushiensis</i> , <i>E. uganicus</i> , <i>E. uralensis</i> , <i>E. uralensis</i> subsp. <i>komarovii</i> , <i>E. vaillantianus</i> , <i>E. villosus</i> , <i>E. virginicus</i> , <i>E. virginicus submuticus</i> , <i>E. wawawaiensis</i> , <i>E. weigandii</i> , <i>E. yezoensis</i> , <i>E. yezoensis</i> |

| Genus | Common name | Total no. accs. | Sources | Species introduced |
|-------------------|-----------------|-----------------|--|---|
| <i>Elaeagnus</i> | Rusian olive | 9 | Hungary (1), Philippines (1), Spain (2), Switzerland (1), USSR (4) | <i>E. angustifolia</i> , <i>E. multiflora</i> , <i>E. philippinensis</i> <i>E. pungens reflexa</i> |
| <i>Eucalyptus</i> | Eucalyptus | 742 | Australia (657), Brazil (60), Costa Rica (1), Cuba (1), Indonesia (2), Morocco (1), Papua New Guinea (1), UK (2), USSR (1), Zimbabwe (11), Unknown (5) | <i>E. albens</i> , <i>E. brockwayi</i> , <i>E. caleyi</i> , <i>E. camaldulensis</i> , <i>E. cambageana</i> , <i>E. conica</i> , <i>E. elata</i> , <i>E. erythrocorys</i> , <i>E. gracilaia</i> , <i>E. gracilis</i> , <i>E. grandis</i> , <i>E. intertexta</i> , <i>E. jacobiana</i> , <i>E. microtheca</i> , <i>E. oblique</i> , <i>E. ochrophloia</i> , <i>E. orgadophila</i> , <i>E. pellita</i> , <i>E. populnea</i> , <i>E. regnans</i> , <i>E. salubris</i> , <i>E. sargentii</i> , <i>E. spathulata</i> , <i>E. tereticornis</i> , <i>E. terminalis</i> , <i>E. accidentalis</i> , <i>E. acmenioides</i> , <i>E. alba</i> , <i>E. annulata</i> , <i>E. argillacea</i> , <i>E. argophloia</i> , <i>E. baxteri</i> , <i>E. kondinensis</i> , <i>E. lesouefii</i> , <i>E. loxophleba</i> sub sp. <i>loxophl.</i> , <i>E. mcintyreensis-bencoxylor</i> , <i>E. bigalerita</i> , <i>E. blakelyi</i> , <i>E. brassiana</i> , <i>E. brockwaiji</i> , <i>E. brockwayi</i> , <i>E. buprestium</i> , <i>E. Caesia</i> , <i>E. calophylla</i> , <i>E. camabulensis</i> , <i>E. camadulensis</i> , <i>E. camaldulensei</i> , <i>E. camaldulensis</i> , <i>E. camaldulensis</i> sssp. <i>simulata</i> , <i>E. camaldulensis</i> v. <i>camaldulensis</i> , <i>E. camaldulensis</i> var. <i>obtusa</i> , <i>E. camaldulensis</i> var. <i>obtuse</i> , <i>E. camaldulensis</i> var. <i>tereticornis</i> , <i>E. camaldulensis</i> var. <i>camaldutensis</i> , <i>E. cambageana</i> , <i>E. camldulensis</i> var. <i>obtus.</i> , <i>E. campaspe</i> , <i>E. chamaldulensis</i> , <i>E. citndora</i> , <i>E. citriodora</i> , <i>E. cloeziana</i> , <i>E. cneorifolia</i> , <i>E. cneoriolia</i> , <i>E. conglobata</i> , <i>E. cooperana</i> , <i>E. cornuta</i> , <i>E. corrugata</i> , <i>E. cosmophylla</i> , <i>E. crepanophylla</i> , <i>E. deglupta</i> , <i>E. delegatensis</i> , <i>E. desmondensis</i> , <i>E. dichromophloia</i> , <i>E. diversicolor</i> , <i>E. diversifolia</i> , <i>E. doglupta</i> , <i>E. dumosa</i> , <i>E. dundasii</i> , <i>E. dunnii</i> , <i>E. exserta</i> , <i>E. ficifolia</i> , <i>E. foecunda</i> , <i>E. forrestiana</i> , <i>E. gardneri</i> , <i>E. globoidea</i> , <i>E. globulus</i> , <i>E. globulus</i> sub sp. <i>bicostata</i> , <i>E. globulus</i> sub sp. <i>globules</i> , <i>E. globulus</i> sup sp. <i>globulus</i> , <i>E. gomphocephala</i> , <i>E. gomphocephalor</i> , <i>E. gongylocarpus</i> , <i>E. goniantha</i> , <i>E. gracilis</i> , <i>E. grandis</i> , <i>E. gummifera</i> , <i>E. incrassata</i> , <i>E. intertexta</i> , <i>E. jacksonii</i> , <i>E. kondinensis</i> , <i>E. laesia</i> , <i>E. lansdowneana</i> , <i>E. laucoxylon</i> , <i>E. lehmannii</i> , <i>E. leucoxylon</i> , <i>E. longicornis</i> , <i>E. longifolia</i> , <i>E. macarthurii</i> , <i>E. macarthurii</i> , <i>E. macro rhynga</i> , <i>E. macrocarpa</i> , <i>E. macrorhyncha</i> , <i>E. macrorhyncha</i> sub. sp. <i>macrophy</i> , <i>E. macrorhyncha</i> , <i>E. macrorrhyncha</i> , <i>E. maculata</i> , <i>E. marginata</i> , <i>E. megacarnuta</i> , <i>E. melanophlia</i> , <i>E. melliodora</i> , <i>E. microcorys</i> , <i>E. microtheca</i> , <i>E. miniata</i> , <i>E. moluccana</i> , <i>E. nintens</i> , <i>E. nitens</i> , <i>E. nutans</i> , <i>E. oaesia</i> , <i>E. oblique</i> , <i>E. obliqua</i> , <i>E. obtusiflora</i> , <i>E. occidentalia</i> , <i>E. occidentalis</i> , <i>E. oleosa</i> , <i>E. ovata</i> , <i>E. papuana</i> , <i>E. pargiflorens</i> , <i>E. parvifolia</i> , <i>E. pauciflora</i> , <i>E. pauciflorasp. debeuzevillei</i> , <i>E. peeneri</i> , <i>E. pellita</i> , <i>E. phoenicea</i> , <i>E. pileata</i> , <i>E. platypus</i> , <i>E. platypus</i> var. <i>heterophylla</i> , <i>E. polybractea</i> , <i>E. polybractea</i> , <i>E. populnea</i> , <i>E. porosa</i> , <i>E. preissiana</i> , <i>E. propinqua</i> , <i>E. pruinosa</i> , <i>E. ptychocarpa</i> , <i>E. pyriformis</i> , <i>E. pyriformis</i> var. <i>youngiana</i> , <i>E. radiata</i> , <i>E. radiata</i> sub sp. <i>rad.</i> , <i>E. radiata</i> var. <i>australiana</i> , <i>E. redunca</i> , <i>E. remote</i> , <i>E. robertsonii</i> , <i>E. robusta</i> , <i>E. rugosa</i> , <i>E. saligna</i> , <i>E. salmonophloia</i> , <i>E. salmonophora</i> , <i>E. sargentic</i> , <i>E. sessilis</i> , <i>E. seymphocalyx</i> , <i>E. sideroxylon</i> , <i>E. sieberi</i> , <i>E. socialis</i> , <i>E. spanthulute</i> , <i>E. spathulata</i> , <i>E. stoateri</i> , <i>E. striatocalyx</i> , <i>E. strichlandii</i> , <i>E. tenuipes</i> , <i>E. tereticormis</i> , <i>E. tereticormis</i> ssp. <i>tereticornis</i> , <i>E. tessellaris</i> , <i>E. tetragona</i> , <i>E. tetraptera</i> , <i>E. torelliana</i> , <i>E. torquata</i> , <i>E. transcontinentalis</i> , <i>E. umbrawarrensii</i> , <i>E. urophylla</i> , <i>E. uropylla x e. grandis</i> , <i>E. vesinifera</i> , <i>E. viminalis</i> , <i>E. viridis</i> , <i>E. wando</i> , <i>E. wando</i> , <i>E. woodwardii</i> , <i>E. yalatensis</i> , <i>E. youmanii</i> , <i>E. grandis</i> , <i>E. punctata</i> . |
| <i>Eugenia</i> | Jamun | 10 | Australia (2), Brazil (3), Philippines (1), Singapore (2), Spain (1), USA (1) | <i>E. cuminii</i> , <i>E. dysenterica</i> , <i>E. grandis</i> , <i>E. megacarpa</i> , <i>E. myrtifolia</i> , <i>E. stipitata</i> , <i>E. uniflora</i> , <i>E. uvalha</i> , <i>E. wilsonii</i> |
| <i>Euphorbia</i> | Petroleum plant | 33 | Cali Colombia (1), Germany (1), Mexico (3), Philippines (2), Spain (4), USA (16), USSR (2), Unknown (4) | <i>E. antisyp philitica</i> , <i>E. canariensis</i> , <i>E. lashyrus</i> , <i>E. lathirus</i> , <i>E. marginata</i> , <i>E. prunifolia</i> , <i>E. pubescens</i> , <i>E. pulcherrima</i> , <i>E. regis jubae</i> , <i>E. spp. asclepias subulata dcne</i> (identified by Kew), <i>E. terracina</i> , <i>E. tirucalli</i> |

| Genus | Common name | Total no. accs. | Sources | Species introduced |
|--------------------|--------------------------------|-----------------|--|---|
| <i>Fagopyrum</i> | Buckwheat | 258 | Canada (5), China (2), East Germany (14), France (4), Germany (4), Hungary (27), Italy (1), Japan (30), Nepal(42), Poland (8), Switzerland (1), Syria (1), UK (6), USSR (73), Unknown (2) | <i>F. cymosum</i> , <i>F. emarginatum</i> , <i>F. esculentum</i> , <i>F. macrocarpum</i> , <i>F. safittatum</i> , <i>F. sagittatum</i> , <i>F. tataricum</i> , <i>F. vulgura</i> , <i>F. latancum</i> |
| <i>Feijoa</i> | Feijoa/ Pine apple guava | 4 | Australia (1), New Zealand (1), Spain (1), USSR (1) | <i>F. sellowiana</i> |
| <i>Fortunella</i> | Kumquat | 9 | Australia (2), France (4), UAR (1), USA (2) | <i>F. hirsii</i> , <i>F. japonica</i> , <i>F. margarita</i> |
| <i>Fragaria</i> | Strawberry | 185 | Australia (3), Canada (13), Czechoslovakia (8), France (1), Holland (5), Italy (23), Nepal (2), Norway (1), South Africa (1), UK (10), Unknown (12), USA (96), USSR (8), Unknown (2) | <i>F. ananassa</i> , <i>F. chiloensis</i> , <i>F. vesca</i> , <i>F. virginiana</i> |
| <i>Garcinia</i> | Mangosteen | 9 | Indonesia (2), Nepal (1), Singapore (1), Sri Lanka (3), USA (2) | <i>G. dulicis</i> , <i>G. magostana</i> , <i>G. morella</i> , <i>G. venulosa</i> , <i>G. xanthochymus</i> |
| <i>Haloxylon</i> | | 10 | Egypt (1), USSR (8), Unknown (1) | <i>H. aphyllum</i> , <i>H. persicum</i> , <i>H. salicornicum</i> |
| <i>Humulus</i> | Hops | 149 | Australia (36), Bulgaria (1), Czechoslovakia (10), Denmark (1), East Germany (3), France (1), Germany (3), Hungary (3), Italy (1), Japan (1), South Africa (9), Sweden (10), UK (6), USA (54), West Germany (9), Unknown (1) | <i>H. japonicus</i> , <i>H. lupulus</i> , <i>H. scandens</i> |
| <i>Jatropha</i> | Jatropha | 9 | Australia (2), Brazil (1), Ghana (4), Nepal (1), Nigeria (1) | <i>J. curcas</i> , <i>J. gossypifolia</i> , <i>J. multifida</i> , <i>J. podarica</i> |
| <i>Lesquerella</i> | Lesquerella | 32 | USA (32) | <i>L. angustifolia</i> , <i>L. auriculata</i> , <i>L. densipila</i> , <i>L. engelmannii</i> , <i>L. fendleri</i> , <i>L. gordonii</i> , <i>L. lasiocarpa</i> , <i>L. lyrata</i> , <i>L. palmeri</i> , <i>L. perforata</i> , <i>L. stonensis</i> |
| <i>Leucaena</i> | Su-babool | 864 | Argentina (3), Australia (205), Cali Colombia (3), France (3), Malawi (5), Mexico (10), Nigeria (2), Philippines (20), South Africa (1), Sweden (2), UK (159), USA (449), Unknown (2) | <i>L. leucocephala</i> , <i>L. collinsii</i> , <i>L. collinsii zacapana</i> , <i>L. cuspidate</i> , <i>L. diversifolia</i> , <i>L. diversifolia var. diversi</i> , <i>L. diversifolia stenocarpa</i> , <i>L. esculenta</i> , <i>L. paniculata</i> , <i>L. glauca</i> , <i>L. greggii</i> , <i>L. insularum</i> , <i>L. lanceolata</i> , <i>L. leucocephala cv. cunningham</i> , <i>L. leucocephala cv. peru</i> , <i>L. leucocephala glabrata</i> , <i>L. macrophylla</i> , <i>L. macrophylla nelsoni</i> , <i>L. multicapitulata</i> , <i>L. nevoluta</i> , <i>L. puluerulenta</i> , <i>L. retusa</i> , <i>L. salvadorensis</i> , <i>L. shannoni</i> , <i>L. trichodes</i> |
| <i>Macadamia</i> | Queensland nut/macadamia nut | 7 | Australia (1), Spain (5), USA (1) | <i>M. integrifolia</i> , <i>M. ternifolia</i> |
| <i>Momordica</i> | Bittergourd | 13 | Bangladesh (1), China (6), Nigeria (5), USA(1) | <i>M. cochinchinensis</i> , <i>M. dioica</i> |
| <i>Myrciaria</i> | Myrciaria | 8 | Brazil(6), USA(2) | <i>M. cauliflora</i> , <i>M. cauliflora cv sabora</i> , <i>M. vexora</i> , <i>M. jaboticaba</i> |
| <i>Nephelium</i> | Rambutan | 5 | Indonesia (1), Sri Lanka (1), USA (3) | <i>N. lappaceum</i> |
| <i>Parthenium</i> | Guayule | 33 | Cali Colombia (1), Germany (1), Mexico (3), Philippines (2), Spain (4), USA (16), USSR (2), Unknown (4) | <i>P. argentatum</i> |
| <i>Perilla</i> | Perilla | 138 | Canada (2), France (3), Hungary (19), Italy (1), Japan (29), Nepal (22), Poland (3), Syria (1), UK (4), USA (34), USSR (18), Unknown (2) | <i>P. frutescence</i> |
| <i>Persea</i> | Avocado | 4 | Australia (1), New Zealand (1), Spain (1), USSR (1) | <i>P. americana</i> |

| Genus | Common name | Total no. accs. | Sources | Species introduced |
|---------------------|---------------------|-----------------|--|--|
| <i>Phaseolus</i> | Scarlet runner bean | 19 | Canada(1), France(1), USA(1), Unknown(16) | <i>P. multiflorus</i> |
| <i>Psophocarpus</i> | Winged bean | 300 | Australia (38), Costa Rica (1), Ghana (7), Indonesia (30), Nigeria (31), Papua New Guinea (35), Philippines (22), Puerto Rico (18), Sri Lanka (17), Thailand (80), USA (20), Unknown (1) | <i>P. tetragonolobus</i> |
| <i>Pyrus</i> | Pear | 168 | Australia (17), Bulgaria (5), Canada (3), Iran (3), Israel (4), Italy (3), Kenya (2), Korea (1), New Zealand (9), Philippines (1), Romania (3), Switzerland (4), USA (81), USSR (16), Unknown (16) | <i>P. communis</i> |
| <i>Prunus</i> | Peach | 396 | Argentina (1), Australia (39), Belgium (1), Brazil (7), Bulgaria (15), Canada (20), Chile (8), Czechoslovakia (4), France (24), Iran (2), Israel (5), Italy (36), Japan (3), Korea (6), Mauritius (2), Philippines (1), Romania (1), Sinkiang (1), South Africa (8), Taiwan (5), Turkey (1), USA (168), USSR (25), Unknown (11), | <i>P. persica</i> |
| <i>Salsola</i> spp. | Salsola | 12 | Canada (1), France (3), Germany (1), Italy (1), USSR (6) | <i>S. kali</i> , <i>S. orientalis</i> , <i>S. palezkiana</i> , <i>S. pestifer</i> , <i>S. richoteri</i> , <i>S. richteri</i> , <i>S. rigida</i> , <i>S. soda</i> |
| <i>Simarouba</i> | Paradise tree | 5 | El Salvador (2), Italy (1), UK (1), USA(1) | <i>S. glauca</i> |
| <i>Simmondsia</i> | Jojoba | 183 | Australia (1), Israel (2), Mexico (2), UK (1), USA (176), Unknown (1) | <i>S. chinensis</i> |
| <i>Symphytum</i> | Russian comfrey | 1 | USSR (1) | <i>S. peregrinum</i> |
| <i>Triticale</i> | | 820 | Australia (17), Brazil (10), Bulgaria (1), Canada (3), Denmark (1), Germany (23), Greece (1), Hungary (9), Japan (4), Mexico (542), Norway (1), Poland (29), USA (149), USSR (29), Unknown (1) | <i>Triticale</i> sp. |
| <i>Vaccinium</i> | Black berry | 90 | Holland (1), Sweden (5), USA (84) | <i>V. acrobacteatum</i> , <i>V. amoenum</i> , <i>V. atrococcum</i> , <i>V. bracteatum</i> , <i>V. corymbosum</i> , <i>V. crenatum</i> , <i>V. erythrocarpum</i> , <i>V. uscatum</i> , <i>V. hirtum</i> , <i>V. macrocarpon</i> , <i>V. membranaceum</i> , <i>V. myrtillus</i> f. <i>epruinosum</i> , <i>V. myrtillus</i> , <i>V. myrtillus</i> , <i>V. neilgherrense</i> , <i>V. ovalifolium</i> , <i>V. ovatum</i> , <i>V. oxycoccus</i> , <i>V. padifolium</i> , <i>V. pallidum</i> , <i>V. parvifolium</i> , <i>V. stamineum</i> , <i>V. uliginosum</i> , <i>V. vitis idaea</i> |
| <i>Vicia</i> | Broad bean | 1309 | Afghanistan (1), Australia (2), Bulgaria (153), Canada (1), China (6), Cyprus (1), Czechoslovakia (6), Egypt (3), Eritrea (2), France (1), Germany (133), Holland (8), Hungary (14), Israel (48), Italy (120), Japan (1), Nepal (1), Netherlands (1), New Zealand (2), Poland (1), Portugal (1), Spain (6), Sweden (6), Syria (191), Syria (440), UAR (2), UK (11), USA (100), USSR (29), West Germany (1), Yugoslavia (1), Unknown (16) | <i>V. faba</i> |

| Genus | Common name | Total no. accs. | Sources | Species introduced |
|--------------|-------------|-----------------|--|---------------------|
| <i>Vigna</i> | Adzuki bean | 160 | Belgium (11), Cali Colombia (5), Germany (1), Japan (10), Thailand (2), USA (131) | <i>V. angularis</i> |
| <i>Vigna</i> | Rice bean | 148 | Belgium (39), Brazil (5), Cali Colombia (5), Costa Rica (1), Germany (2), Indonesia (8), Taiwan (4), UK (1), USA (82), Zaire (1) | <i>V. umbellata</i> |

composition of other amino acids. Three domesticated species, namely, *A. hypochondriacus*, *A. caudatus* and *A. cruentus* are important for cultivation as grain crop in India, while *A. edulis* is mainly cultivated in Argentina. A total of 889 accessions of amaranth have been introduced from different countries including USA, Nigeria, Kenya, Germany, Taiwan, Netherlands, Poland, USSR/Russia, Chile, Hungary and Thailand. These have been evaluated alongwith about 2,000 indigenous germplasm accessions (Joshi and Rana, 1991), of which 72 promising accessions have been identified (Rathi *et al.*, 2005). Some of the promising amaranth introductions identified for different traits are given in Table 2. Variety Suvarna was selected from an American introduction (Rhodale Plus) released for cultivation in peninsular India. Presently, over 3,000 collections of

amaranth are being maintained as active collections, representing 13 species, namely, *A. hypochondriacus*, *A. caudatus*, *A. cruentus*, *A. hybridus*, *A. retroflexus*, *A. lividus*, *A. viridis*, *A. graevizans*, *A. dubious*, *A. spinosus*, *A. tricolor*, *A. blitum* and *A. cannabinus* at NBPGR Regional Stations, Thrishur, Akola and Shimla. Some accessions are also being maintained as active collections at various Agricultural Universities and ICAR Institutes. The important gene AMA 1 isolated from amaranth for quality protein is being transferred in crops like potato and rice.

2. Buckwheat (*Fagopyrum* spp.)

Buckwheat is a crop with varied uses primarily as food grain with higher protein and balanced amino acid composition, also used as leafy vegetable, medicinal

Table 2. Promising introductions of amaranth

| S. No. | Trait | Promising accession |
|--------|---------------------------|--|
| 1. | High grain yield | EC133859, EC13594, EC3828, EC10238, EC6646, EC1493, EC289378, EC322033, EC328875, EC328889, EC322996, EC321557, EC321561, EC386315, EC386974, EC157415, EC269381 |
| 2. | Stem borer resistance | EC13594, EC133839 |
| 3. | Highly cross incompatible | EC13594 |
| 4. | Early maturing | EC13594, EC10238, EC198119, EC322043, EC333744, EC341799, EC321553, EC321556, EC328895, EC328884, EC387820, EC359459, EC359409, EC322882, EC328889, EC15441 |
| 5. | Vegetable type | EC147927, EC147969, EC149890, EC16512, EC328892, EC328882, EC386966, EC387821 |
| 6. | Dwarf type | EC322882, EC322032, EC32156, EC322994, EC322997 |
| 7. | Early flowering | EC322882, EC328889, EC321553, EC239336 |
| 8. | Leaves per plant | EC328889, EC223671, EC386987 |
| 9. | High protein | EC322032, EC170317, EC289386, EC289412 |
| 10. | Seed weight | EC322211, EC321557, EC387824, EC386988, EC386992, EC386984 |
| 11. | Number of spikelets | EC338958, EC222746, EC387025 |
| 12. | Long inflorescence | EC35563, EC35677, EC35727, EC321563, EC386970, EC354979, EC289386, EC170314, EC289408, EC359408, EC157415 |
| 13. | Biological yield | EC321553 |
| 14. | Harvest index | EC321553, EC321557 |
| 15. | Number of leaves | EC321556, EC321561, EC277972 |
| 16. | Plant height | EC321558, EC328887, EC386959, EC170314, EC38695, EC386987 |
| 17. | Field resistant (Pests) | EC321557, EC321561 |
| 18. | Stem thickness | EC354979, EC359437 |
| 19. | Leaf length | EC386959 |
| 20. | Tall type | EC35601 |
| 21. | Leaf width | EC3511567, EC359342 |
| 22. | High oil content | EC321558, EC328889, EC359442 |

plant (source of glucoside 'rutin') and a support crop for apiary. A total of 258 germplasm lines of buckwheat have been introduced from different countries, namely, USA, USSR, Sweden, Germany, Hungary, Poland, Nepal and Japan and evaluated along with over 400 indigenous accessions (Joshi and Paroda, 1991) and 30 promising lines were identified from the exotic introductions (Rathi *et al.*, 2005). Some of the promising buckwheat introductions identified for different traits are presented in Table 3. Presently, 568 accessions of buckwheat belonging to six species, viz. *F. tataricum*, *F. esculentum*, *F. emerginatum*, *F. gigantium*, *F. cymosum* and *F. himalayanum* are being maintained as active collections at NBPGR Regional Station, Shimla and three varieties have been identified and released for cultivation under AICRP on Underutilized Crops.

Table 3. Promising introductions of buckwheat

| Trait | Promising accession |
|-------------------------|--|
| Early flowering | EC38954, EC218740, EC323724, EC323731, EC323729 |
| High grain yield | EC161416, EC218737, EC216622, EC216628, EC218742, EC218753, EC218772, EC218738, EC323724, EC323731, EC323729, EC321798, EC386669, EC216634, EC286376, EC323723, EC131622, EC386671, EC218740 |
| Number of internodes | EC218740, EC321798, EC216635, EC272738, EC131622 |
| Seed weight | EC218740, EC321798, EC386667, EC386669, EC272734, EC18049, EC386671, EC218738, EC131620, EC97262, EC272734 |
| Plant height | EC218738, EC386669 |
| Early maturing | EC218738, EC321798, EC386667, EC386669, EC286396, EC386671, EC218784, EC323729, EC323731 |
| Number of branches | EC321798, EC216634, EC272734 |
| Field resistance (Pest) | EC386667 |
| Leaf length | EC272734 |
| Leaf width | EC321800 |

3. Chenopods (*Chenopodium* spp.)

Five species of *Chenopodium*, namely, *C. album*, *C. nuttaliae*, *C. pallidicaule*, *C. publense* and *C. quinoa* are known to be cultivated but the former two are more popular. *C. album* is most widely distributed and is grown in Himalayas, generally consumed mixed with cereals and as leafy vegetable. 285 accessions of *Chenopodium*, mainly of *C. quinoa* have been introduced and tested for adaptability, of which 17 were observed to be promising for various traits. Some of the promising introductions identified for different traits are EC201678, EC359445, EC201618 for high grain yield; EC351912 for dwarf plant type; EC359447, EC359445, EC359449,

EC338953, EC319184, EC329521 for tall plant type; EC359447 for number of branches; EC201678 for early flowering; EC180010 for early maturity; EC351912, EC201678, EC359447 for bold seed; EC338952, EC359451, EC359417 for inflorescence length; EC359448, EC359449 for leaves per plant; EC359445, EC359449, EC338953, EC359451 for leaf length and EC359447, EC359451 for leaf width. *C. quinoa* was adapted to Indo-gangetic plains and some CH/LKW lines have been developed. At present, 76 accessions of chenopodium, belonging to six species, namely, *C. album*, *C. amaranticolor*, *C. ambrisoides*, *C. botryas*, *C. murale* and *C. quinoa* are being maintained at NBPGR Regional Station, Shimla.

4. Adzuki bean (*Vigna angularis*)

Adzuki bean has varied uses as food, forage, medicine and cosmetics. One hundred and sixty accessions of adzuki bean have been introduced from USA, Nigeria, Belgium, Colombia and Japan, and characterized for agro-morphological traits, of which 92 have been found promising for different traits. Some of the promising introductions identified for different traits are given in Table 4. Two varieties of adzuki bean have been identified, one each by CSK HPKV, Palampur and VPKAS, Almora for cultivation in Himachal Pradesh and Uttaranchal, respectively. Presently, 142 accessions of adzuki bean are being maintained at NBPGR Regional Station, Shimla as active collections.

5. Rice bean (*Vigna umbellata*)

Rice bean is a promising multipurpose crop with good potential for use as food, fodder, green manure and a cover crop. In India, it is distributed in tribal regions of the north-east and the northern hills. Considerable variation is reported to exist between collections from different geographical areas. Seed size resembles cowpea to mung/urid bean and colour varies from dark brown to red, light brown, yellow, pale and light green.

Evaluation of 148 introduced accessions along with over 800 indigenous collections of rice bean at Shillong showed a wide range of variation for days to flowering (62-112), plant height (94-334 cm), branches per plant (3-12), pod length (7.3-14.0 cm), seeds per pod (5-10), pods per peduncle (2-11), 100 seed weight (4-25 g) and grain yield per plant (4.4-133.0 g).

Analysis of biochemical constituents of rice bean seeds showed considerable variation for crude protein

(17.8-25.2%), ash (3.8-4.1%), calcium (315-450 mg/100 g), phosphorus (197-393 mg/100 g) and iron (1-5 mg/100 g). A significant evaluation and selection work has been done under the AICRP and has resulted in the identification of 53 useful lines and development of 5 varieties. Some of the promising rice bean introductions identified for different traits are given in Table 5.

6. Faba bean (*Vicia faba*)

Faba bean is used as food and feed crop. It is cultivated as a vegetable and is used green or dried, fresh or canned. It has high protein content and is used as a substitute for meat or skimmed milk. It is grown in warm temperate and sub-tropical areas, in rich loamy soils and is more tolerant to acidic conditions, particularly sulphate ion, as compared to most of the legumes. In

Table 4. Promising introductions of adzuki bean

| Trait | Promising accession |
|---|--|
| High seed yield | EC108080, EC108079, EC87897, EC87896, EC87899-1, EC108080, EC15257, EC120460, EC241041, EC120960, EC15057, EC240460, EC340245, EC340248, EC340275, EC340276, EC81957, EC340280, EC15256, EC340246, EC340270, EC340273, EC340279, EC340258, EC340282, EC340283, EC340263, EC18151, EC290251, EC34625, EC340281, EC340255, EC387896, EC115820, EC144038, EC144039, EC28540 |
| Early maturing | EC87896, EC87899, EC108080, EC87895, EC15257, EC120460, EC15256, EC340265, EC281186, EC390260, EC340272, EC8789, EC30256, EC18959, EC241187, EC340251, EC276 |
| Number of primary branches | E 87896, E 108080, EC120460, EC340252, EC340252, EC340263, EC340285, EC8789, EC30256 |
| Pods per plant | EC87896, EC108080, EC120460, EC340280, EC340277, EC181168, EC340285, EC290251, EC34625, EC5949, EC340260, EC187896, EC340255, EC36070 |
| Seed weight | EC87896, EC108080, EC340280, EC390285, EC340283, EC340263, EC340277, EC346258, EC18151, EC34625, EC8707, EC12045, EC348258, EC340264, EC263, EC24523, EC34027, EC390296, EC57169, EC87898, EC108070, EC120460 |
| Pod length | EC87899-1, EC120460, EC241041, EC340280, EC340285, EC8789 |
| Number of clusters | EC87899, EC108080 |
| Plant height | EC108080, EC15257, EC340258, EC340263, EC340227, EC340256, EC340285, EC34625, EC30250, EC30256, EC340255, EC387896, EC30270, EC34025, EC340261 |
| Early flowering | EC108080, EC108070, EC87895, EC120460, EC241041, EC340280, EC340263, EC34258, EC12045, EC340255, EC387896, EC18959, EC346263, EC340278 |
| Dwarf type | EC108074, EC100877, EC15257, EC89957 |
| Large pod size | EC101080, EC15257 |
| Petiole length | EC 15257, EC 120460, EC 340280, EC 340258, EC 340265, EC 87071, EC 340264 |
| Leaf width | EC15257, EC120460, EC340280, EC340265, EC340263, EC281186, EC340256, EC340281, EC5949, EC30256 |
| Seeds per pod | EC15257, EC120460, EC340265, EC340263, EC293, EC30256, EC264, EC340260, EC252, EC340251, EC340269, EC370269, EC24523, EC120480 |
| Pods per cluster | EC120460, EC340285, EC30256, EC348258, EC720460 |
| Leaf length | EC120460, EC340280, EC281186, EC340227, EC290251, EC34625, EC8789, EC340260, EC340251, EC340278 |
| Tolerant to <i>Cercospora</i> and <i>Uromyces</i> disease | EC108080 |

Table 5. Promising introductions of rice bean

| Trait | Promising accession |
|----------------------------|---|
| High seed yield | EC18113, EC18181, EC18171, EC16167, EC12136, EC12416, EC18114, EC18114-2, EC18229, EC18566, EC18567, EC18565, EC97882, EC11476, EC12436, EC18184, EC18183-A, EC18183-B, EC18230, EC18113-A, EC18136, EC37242, EC37244, EC7244-C, EC161887, EC37221-1, EC37242-2, EC18183, EC97882-A, EC26365, EC18562, EC18153, PI 194787, PI 24786 |
| Early flowering | EC12463, EC16167 |
| Early maturing | EC12463, EC18171, EC16167, EC101887, EC114123, EC15115, EC98452, EC30931, EC247821, EC98453, EC182228, EC90453, PI 247687, PI 247643 |
| Long pod | EC18565 |
| Dwarf type | EC18583-3 |
| Prolific pod bearing | EC18113-A, EC37240, EC97882-A, EC97882-C, EC16167-A, E 242723 |
| Field tolerance to disease | EC8113-A, EC97882-C, EC16167-A |
| Vegetable type | EC37225-D |

India, its cultivation is confined to Himalayan hills, northern and north-eastern plains. A total of 1,309 accessions of faba bean have been introduced and evaluated at Hisar and Delhi. The accessions have shown a wide range of variation for days to flowering (68-94), maturity period (121-188 days), plant height (44-100 cm), branches per plant (1-6), internode length (1.4-4.0 cm), clusters per plant (4.0-46.3), pods per plant (4.7-73.6), seeds per pod (2-3), 100 seed weight (18.3-78.9 g) and seed yield per plant (24.0-49.8 g). Considerable variation for seed protein and also an anti-metabolite factor, viz., vicine-convicine has been reported and lines showing upto 27 per cent protein earmarked. Thirty six promising accessions have been identified for various traits and one variety (Vikrant) has been released for cultivation. Some of the promising faba bean introductions identified for different traits are given in Table 6.

7. Winged bean (*Psophocarpus tetragonolobus*)

Winged bean is rich in protein and oil and holds promise as a multipurpose crop. Its pods, seeds and roots are edible and the plant is used as fodder. It is also used as green manure and a cover crop. In India, its cultivation is confined to humid sub-tropics (Bengal, Bihar, North-eastern region, Deccan plateau and Western ghats). Characterization of 300 exotic and 160 indigenous accessions of winged bean for 25 descriptors revealed considerable variability for various yield attributes. Pod length was observed to vary from 8.4 to 35.7 cm, with both small and large poded types belonging to Indonesia. Flowering ranged from 74-145 days with the earliest flowering types represented from Papua New Guinea and late flowering types from Indonesia. The range of variation in seeds per pod was 4-18, with the highest occurrence in the Indonesian material. The indigenous germplasm included high tuber yielding types. Eighty

eight promising accessions have been identified from the introduced germplasm. Some of the promising winged bean introductions identified for different traits are given in Table 7. A dual-purpose variety (AKWB 1) of winged bean has been released for cultivation and around 250 accessions of winged bean are being maintained at NBPGR Regional Station, Akola as active collections.

8. Horse tail tree (*Casuarina* spp.)

Casuarina is a fast growing tree with potential for fuel wood, which can be successfully grown under saline conditions. Twenty five accessions of three species, viz., *C. equisetifolia*, *C. cunninghamia* and *C. cristata* were introduced and evaluated at Tamil Nadu Agricultural University, Mettupalayam. A wide range of variation was observed for plant height (1.50-5.05 m), basal diameter (2.50-5.97 cm) and diameter at breast height (0.80-3.47 cm). Studies at the Central Soil Salinity Research Institute, Karnal, revealed that *C. equisetifolia* showed 90-95 per cent survival, both in surface planting and channel planting methods under higher salinity levels. The plant is now being researched under the project on Agro-forestry.

9. Salt bush (*Atriplex* spp.)

Salt bushes are perennial fodder shrubs, which can be grown successfully on highly saline soils under low rainfall conditions. Thirty six accessions of nine species of *Atriplex*, namely, *A. amnicola*, *A. bunburyana*, *A. cinerae*, *A. lentiformis*, *A. paludosa*, *A. undulata*, *A. nummularia*, *A. canescens* and *A. halimus* were evaluated at NBPGR Regional Station, Jodhpur. Considerable variation was observed for different growth traits. Three species viz., *A. nummularia*, *A. canescens* and *A. halimus*, were observed to perform well in the arid regions of Rajasthan.

Table 6. Promising introductions of faba bean

| S. No. | Trait | Promising accession |
|--------|------------------------------|--|
| 1. | Early maturing | EC117748, EC117787, EC243746, EC273859, EC117724, EC354985 |
| 2. | Pods per plant | EC329584, EC329585, EC329591, EC117817, EC117810 |
| 3. | Seeds per pod | EC329640, EC329642, EC329644 |
| 4. | High seed yield | EC329649, EC329729, EC329720, EC243629, EC243707, EC243743, EC243763, EC243823 |
| 5. | Early flowering | EC329720, EC325185, EC329625, EC329662, EC329717, EC329680 |
| 6. | Tall type | EC329720, EC325185, EC29625, EC329662, EC329717 |
| 7. | Low susceptibility to aphids | EC329717, EC243763, EC243743, EC243890, EC116634, EC117727, EC117745, EC117757, EC243761, EC243883, EC329604, EC329645, EC117810 |

10. Guayule (*Parthenium argentatum*)

This desert shrub, native of north-central Mexico and south-western United States, is drought hardy, well-suited to arid lands with 250–300 mm rainfall and is a good source of rubber. Twenty-eight accessions were evaluated at NBPGR, New Delhi, and a wide range of variation was observed for stem girth (9.1–17.6 cm), plant circumference (203.4–237.7 cm), fresh biomass yield per plant (690–873 g), dry biomass yield per plant (360–432 g), rubber content (4.7–7.4%) and resin content (4.2–6.2%). The germplasm is now being maintained at Gujarat Agricultural University, S.K. Nagar and CCS Haryana Agricultural University, Hisar. Two varieties, namely, Arizona 2 and HG 8 have been identified as high yielding.

11. Jojoba (*Simmondsia chinensis*)

This hardy shrub, native to northern Mexico and south-western United States, is valued for its seed oil, which is a substitute for sperm whale oil and is used as lubricant and fuel when mixed with alcohol, and also in pharmaceuticals and cosmetics. This species has been tried at several sites in India with variable edapho-climatic conditions and has been found successful on arid lands and coastal wastelands. Evaluation of germplasm, comprising 183 accessions, at 60 month stage at NBPGR Regional Station, Jodhpur, revealed

a wide range of variation for plant height (33–123 cm), plant canopy (36 x 24 cm–142 x 142 cm) and internode length (2.0–4.0 cm). One accession as variety (EC33198) has been released for cultivation. The species is being promoted by the Department of Agriculture, Rajasthan for large scale cultivation.

12. *Cuphea* spp.

These species adapted to temperate climate are good sources for industrial oils. Germplasm evaluation of 30 accessions of different *Cuphea* species, viz., *C. wrightii*, *C. lutea*, *C. painteri*, *C. procumbens* and *C. carthagenensis*, at NBPGR Regional Station, Shimla, revealed a wide range of variation for different traits. The range of variation observed was 61.2–69.9 cm for plant height, 11.3–13.0 for branches per plant, 48.5–59.5 for number of leaves, 38.6–44.9 for number of capsules, 1.7–2.4 cm for capsule length, 89–94 days to flowering, 129–138 days to maturity, 2.03–2.08 g for 1000 seed weight and 13.6–67.0 for seed yield per plant.

13. Paradise tree (*Simarouba glauca*)

This tree species, introduced from El Salvador in 1968, has a very high potential. Its seeds contain 55–60 per cent edible oil comparable to ground nut in quality. The press-cake contains 60–69 per cent protein and is a good source of organic manure (N 7.7 to 8.1%,

Table 7. Promising introductions of winged bean

| Trait | Promising accession |
|--------------------------|--|
| Frost resistant | EC11073, EC11074 |
| High tuber yield | EC111205, EC114073, EC27855, EC27884, EC116886, EC38959, EC128269, EC142600-1, EC251020 |
| Fodder type | EC114073, EC27884, EC111074 |
| High seed yield | EC36942, EC37885, EC38825, EC27885, EC27884, EC38821, EC27886-A, EC38957, EC116886, EC38959, EC38955-A, EC38957-A, EC38824, EC27886, EC38955, EC116885, EC27886-A-1, EC116884, EC121918, EC118345, EC27886-A-2, EC116889, EC27006, EC38821-P-1, EC38956, EC38825-1, EC38831-3, EC38855-1, EC38955-B, EC38957-1, EC142666, EC178268, EC178319, EC178322, EC178337, EC26170, EC34865-1, EC49558, EC11885, EC121919, EC142653, EC178306, EC38823, EC114273-B, EC178313, E178271, EC178331, EC142665 |
| Green pod yield | EC38825-P-3, EC27885, EC8821, EC38957, EC38959, EC38955-A, EC38957-A, EC38824, EC38955, EC116884, EC118345, EC121906, EC121907, EC121908 |
| Seeds per pod | EC38821, EC116885 |
| Forage yield | EC111074, EC114273-1 |
| Early flowering | EC27886-A, EC38821-P-2, EC38821-P-4, EC27886-A-2 |
| Early maturing | EC38955-A, EC38821-P-2, EC38956 |
| Pod yield | EC38824, EC38954, EC38825-1, EC38955-B, EC114273-B, EC116884, EC118645, EC121906, EC21907, EC121908 |
| Long pod | EC116885, EC121920, EC121918 |
| Late type | EC1301813, EC130182, EC130186, EC130184, EC130185 |
| Pod quality | EC116884, EC118645, EC121906 |
| Suitable for North India | EC116884, EC118345, EC121906, EC121907, EC121908 |
| Photosensitive strain | EC130184, EC130185, EC121921, EC130283 |
| Pod length | EC118345, EC26942, EC26945, EC178279, EC178331 |
| Tuber length | EC112417, EC178302, EC26904, EC26944, EC26949-1, EC34865-2, EC38821-B, E 41979, EC45225, EC95238 |
| Number of tubers/ plant | EC178279, EC178333, EC178340-1 |

Table 8. Distribution of less known cultivated food plants in different regions of diversity

| Regions/ Food Plants | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 | 11 | 12* | Total |
|----------------------|-----|-----|---|----|----|----|----|-----|----|-----|----|-----|-------|
| Tuber/ root types | 26 | 22 | 1 | 7 | – | 4 | 8 | 28 | 9 | 26 | 5 | 5 | 141 |
| Vegetables | 56 | 31 | 1 | 11 | – | 4 | 24 | 36 | 29 | 18 | 6 | 2 | 218 |
| Flowers | 2 | 2 | 1 | 2 | – | – | 2 | – | – | – | 1 | – | 10 |
| Fruits | 50 | 61 | 2 | 17 | 19 | 13 | 5 | 13 | 14 | 69 | 36 | 38 | 337 |
| Seeds/ nuts | 18 | 14 | 3 | 11 | 1 | 10 | 7 | 21 | 6 | 12 | 8 | 4 | 115 |
| Miscellaneous | 20 | 36 | – | 8 | 1 | 2 | 24 | 29 | 20 | 19 | 5 | 7 | 171 |
| Total diversity | 172 | 166 | 8 | 56 | 21 | 33 | 70 | 127 | 78 | 144 | 61 | 56 | 992 |

* The 12 regions of diversity of crop plants are: 1. Chinese-Japanese, 2. Indo-Chinese-Indonesian, 3. Australian, 4. Hindustani, 5. Central Asian, 6. Near Eastern, 7. Mediterranean, 8. African, 9. European-Siberian, 10. South-American, 11. Central American and Mexican, 12. North American.

P 1.07% and potash 1.24%). The bitter (toxic) element extracted from press-cake of *S. glauca* kernels has been used as amoebicide (Glaumeba). The shells (endocarp) can be used in hard-board industry. The mesocarp of the fruit, which constitutes 62 per cent of fruit weight is used in the preparation of squash, beverage and jam. The leaves, bark and wood of *Simarouba* have a long history of usage as a natural medicine by the natives in tropical Americas. Also the wood is light and less preferred by insects and hence useful in making yoke and light furniture. *Simarouba* has adapted well in peninsular India and National Oil Seeds and Vegetable Oils Development Board (NOVOD) is promoting its large scale propagation in Karnataka, Tamil Nadu and Orissa, each of which has around one thousand hectares area under *Simarouba* plantation. Trials are being conducted to identify/ develop suitable location specific genotypes under AICRP (UC).

14. Purging Nut (*Jatropha curcas*)

This industrial oil yielding species is adapted to marginal lands e.g. sandy, clayey, gravel and eroded lands, and produces a semi-drying oil that can be used in fuel mixtures, as an illuminant and/or making soaps and candles. Evaluation of *Jatropha* was carried out at GAU, S.K. Nagar. The range of variation observed was 217-409 cm for plant height, 30-45 for branches per plant, 10-25 for clusters per plant, 69-817 for 1000 seed weight and 25-95 g for seed yield per plant. The growth of *Jatropha curcas* was observed to be better than that of *J. gossipifolia*. One accession of *J. multifida*, introduced from Australia, has also been established well.

Opportunities for Introduction of Underutilized and New Crops in South Asia

The underutilized species are primarily grown in their centres of origin or centres of diversity where they are

still important for the subsistence of local communities. Distribution of such less-known cultivated food plants in different regions of diversity is given in Table 8 (Arora, 1985) which shows that enormous diversity

Table 9. Some important underutilized and neglected crops/ plant species in Asia-Pacific region

| Category | Crops/species diversity |
|------------------|---|
| Pseudocereals | <i>Amaranthus</i> spp., <i>Chenopodium</i> spp., buckwheat (<i>Fagopyrum esculentum</i> , <i>F. tataricum</i>) |
| Small Millets | <i>Digitaria</i> spp., <i>Echinochloa</i> spp., finger millet (<i>Eleusine coracana</i>), proso millet (<i>Panicum miliaceum</i>), pearl millet (<i>Pennisetum americanum</i>), little millet (<i>Panicum sumatrense</i>), kodo millet (<i>Paspalum scrobiculatum</i>), foxtail millet (<i>Setaria italica</i>); others - <i>Brachiaria</i> spp., <i>Coix lachryma-jobi</i> |
| Pulses | Sword bean (<i>Canavalia</i> spp.), hyacinth bean (<i>Lablab purpureus</i>), grasspea (<i>Lathyrus sativus</i>), horse gram (<i>Macrotyloma uniflorum</i>), velvet bean (<i>Mucuna</i> spp.), winged bean (<i>Psophocarpus tetragonolobus</i>), faba bean (<i>Vicia faba</i>), moth bean (<i>Vigna aconitifolia</i>), adzuki bean (<i>Vigna angularis</i>), rice bean (<i>Vigna umbellata</i>), others - pilipisara, <i>Vigna trilobata</i> , <i>Parkia roxburghii</i> (multipurpose) |
| Roots and Tubers | Elephant foot yam (<i>Amorphophallus paeoniifolius</i>), taro (<i>Colocasia esculenta</i>), yams (<i>Dioscorea</i> spp.), <i>Vigna vexillata</i> |
| Vegetables | Cucurbitaceae (<i>Benincasa</i> , <i>Luffa</i> , <i>Momordica</i> , <i>Trichosanthes</i> spp.), aibika (<i>Abelmoschus manihot</i>), leafy amaranth (<i>Amaranthus</i> spp.), <i>Brassica</i> spp., Kangkong (<i>Ipomoea aquatica</i>) |
| Fruits and Nuts | Jackfruit (<i>Artocarpus heterophyllus</i>), breadfruit (<i>A. allitii</i>), carambola (<i>Averrhoa carambola</i>), longan (<i>Dimocarpus longan</i>), pilinut (<i>Canarium ovatum</i>), durio (<i>Durian zibethinus</i>), Indian gooseberry (<i>Emblica officinalis</i>), mangosteen (<i>Garcinia mangostena</i>), duku (<i>Lansium domesticum</i>), litchi (<i>Litchi chinensis</i>), <i>Manilkara</i> spp., rambutan (<i>Nephelium lappaceum</i>), pistachio (<i>Pistachia vera</i>), jamun (<i>Syzygium cumini</i>), tamarind (<i>Tamarindus indica</i>), Indian jujube/ber (<i>Ziziphus mauritiana</i>), Chinese jujube (<i>Ziziphus jujube</i>) |
| Oil plants | Safflower (<i>Carthamus tinctorius</i>), colocynth (<i>Citrullus colocynthis</i>), niger (<i>Guizotia abyssinica</i>), physic nut (<i>Jatropha curcas</i>), sesame (<i>Sesamum indicum</i>) |
| Fibres and Pulp | Ramie (<i>Boehmeria nivea</i>), sunn hemp (<i>Crotalaria juncea</i>), kenaf (<i>Hibiscus cannabinus</i>), flax (<i>Linum usitatissimum</i>), dhaincha (<i>Sesbania bispinosa</i>) |
| Others | Sago palm (<i>Metroxylon sago</i>), bamboo |

exists world wide for the underutilized plants and thus, there is an ample scope of introducing exotic material from diverse geographic regions of the world.

Eco-regional approach and inter-institutional collaboration are needed to promote the use of underutilized species e.g. there exists a strong inter-regional interest in south, south-east and east Asia for crops like amaranth, buckwheat, rice bean, faba bean, minor millets, sesame, Lathyrus, safflower, taro, minor tropical vegetables and fruits. Inter-institutional collaboration at international, regional and national level can be helpful in promoting the use of underutilized species.

Information compiled by Bioversity International, International Centre for Underutilized Crops (ICUC) and National Academy of Sciences (NAS/USA) (Eyzaguirre *et. al.*, 1999) provides a list of about 200 such underutilized priority species which include millets – 29 species, oil plants – 10, pulses – 27, root and tubers – 25, spices – 2, fruits and nuts – 52, minor fruits – 24, vegetables – 39 and fibre and pulp yielding plants – 5. Out of these, the species listed species in Table 9 are more important to the Asia-Pacific region.

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