GERMPLASM RESOURCES, PRODUCTION AND BIOTIC PROBLEMS OF DRY BEAN (*Phaseolus vulgaris* L.) IN CHINA

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**Germplasm collection and evaluation**

In China, dry bean germplasm is widely distributed in the north temperate and subtropical zones, located between 22°-50° latitude N and with altitude 50-3000 m. The three main areas in which the majority of dry bean germplasm collection have been made are: a) the Northeast Plains, b) the Northwest (the Loess Plateau), and c) the Southwest (the Yunnan-Guizhou Plateau). By 1995, 4029 dry bean accessions had been collected from 17 provinces. Of them, 3845 are landraces, 3 improved materials, and 181 introduced from 20 countries. To date, 3330 accessions have been stored in the national gene bank (NGB) for long-term conservation at condition of -18±2 °C and RH 50±7%.

A total of 4029 accessions have been evaluated for characters, such as habit, days to flowering and maturity, plant height, flower color, pod length and shape, seed color and shape, seed yield/plant and 100-seed weight, etc. 4029 accessions were divided into three growth habit groups: 858 were in erect (I) group, 589 in semiclimbing (II,IIIa), 2582 in climbing (IIIb,IV). Based on 100-seed weight 387 were in small seeded group, 2683 in medium and 959 in large.

By artificial inoculation, of 1340 dry bean germplasm accessions tested for resistance to anthracnose (*Colletotrichum lindemuthianum*), 4 were highly resistant, 24 resistant and 86 moderately resistant. 1308 accessions were screened for resistance to angular leaf spot (*Phaeoisariopsis griseola*) and, of these, 23 were resistant and 139 moderately resistant. 1332 accessions were evaluated for resistance to aphid (*Aphis croceivora*) under field condition, and only 12 were moderately resistant. Some dry bean accessions were screened for tolerance to drought (R6-R8 stage) and low-temperature (8 °C,VO stage). Of 613 accessions, 4 were highly tolerant to drought. Only 16 of 421 germplasm accessions were highly tolerant to low-temperature. All of the results obtained on dry bean germplasm data were stored in the database of the Crop Germplasm Resources Information System (CGRIS China).

**Dry bean production and main biotic problems**

Dry bean is mainly produced in three regions: 1) Northeast: including the provinces of Heilongjiang, Jilin, Liaoning and east of Inner Mongolia, 2) Northwest: Shanxi, Shaanxi and north of Hebei, 3) Southwest: Sichuan, Yunnan and Guizhou. The intercropping of dry beans with maize, potato, millet, sunflower, cotton and young trees is the main production system. In some areas the improved varieties, especially erect types, have been released and their average yield ranges between 1350-1500 kg/ha, with maximum yields of up to 3750 kg/ha with adequate cultural practices. In recent years some improved varieties have been planted for export, such as Pinyun 2 selected from Ex-Rico 23, Beijing small black bean introduced from US, G0446 is a

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French variety (Gally), G0381 introduced from CIAT (Redkloud) and Dabaiyundou selected from Chinese landraces. Those varieties have good productivity in seed yield from 1500 to 2250 kg/ha.

Diseases and insect pests are the main biotic problems of dry bean production in China, because there are few pesticides or modern cultural practices which could minimize crop damage. Fungal diseases are very common and serious. To date, 36 species of pathogenic fungi have bean reported in common bean, and some of them have significant economic importance, ie. *Colletotrichum lindemuthianum*, the cause of anthracnose, is widely distributed in northern and southern China. *Phaeoisariopsis griseola* is the angular leaf spot pathogen, commonly in southern China at high altitude and cool areas. *Uromyces appendiculatus*, the rust fungus is widely found, specially in green bean fields. Some fungal pathogens are of local importance, such as *Erysiphe polygoni*, *Cercospora canescens*, *Pseudocercospora cruenta*, *Fusarium oxysporum f.sp. phaseoli*, *F. solani f.sp. phaseoli*, *Sclerotinia sclerotiorum* and *Phoma exigua*.

Viral diseases have caused severe problems in recent years. Eleven viruses have been identified so far, and some of them are widely distributed, such as cucumber mosaic virus (CMV), bean common mosaic virus (BCMV), bean yellow mosaic virus (BYMV). Other viruses are broad bean wilt virus (BBWV), peanut clump virus (PCV), clove yellow vein virus (CIYVV), tomato aspermy virus (ToAV), bean mild yellow mosaic virus (BMYMV), tobacco necrosis virus (TNV), bean distortion dwarf virus (BDDV) and tobacco mosaic virus (TMV).

Bacterial diseases also cause serious problems in bean production because diseases can be seed-transmitted. *Xanthomonas campestris pv. phaseoli* is the causal agent of common bacterial blight distributed in some provinces, and *Pseudomonas syringae pv. phaseolicola* causes halo blight, mainly in northern China.

Insect pests cause significant yield losses (10-30%) in dry bean production in China. The most important insect pests are the aphid (*Aphis craccivora*), the legume pod borer (*Maruca testulalis*), and the bean hawk moth (*Clanis bilineata*). Other less important pests include the green stink bug (*Nezara viridula*), the lima bean pod borer (*Etiella zinckenella*) and the sweet potato whitefly (*Bemisia tabaci*).

To control diseases and insect pests, some measures are adopted in limited production areas. Cultural practices and chemicals have been used efficiently, but it is very important for sustainable production to use resistant varieties and biological control in an integrated pest management (IPM) fashion.

**References**