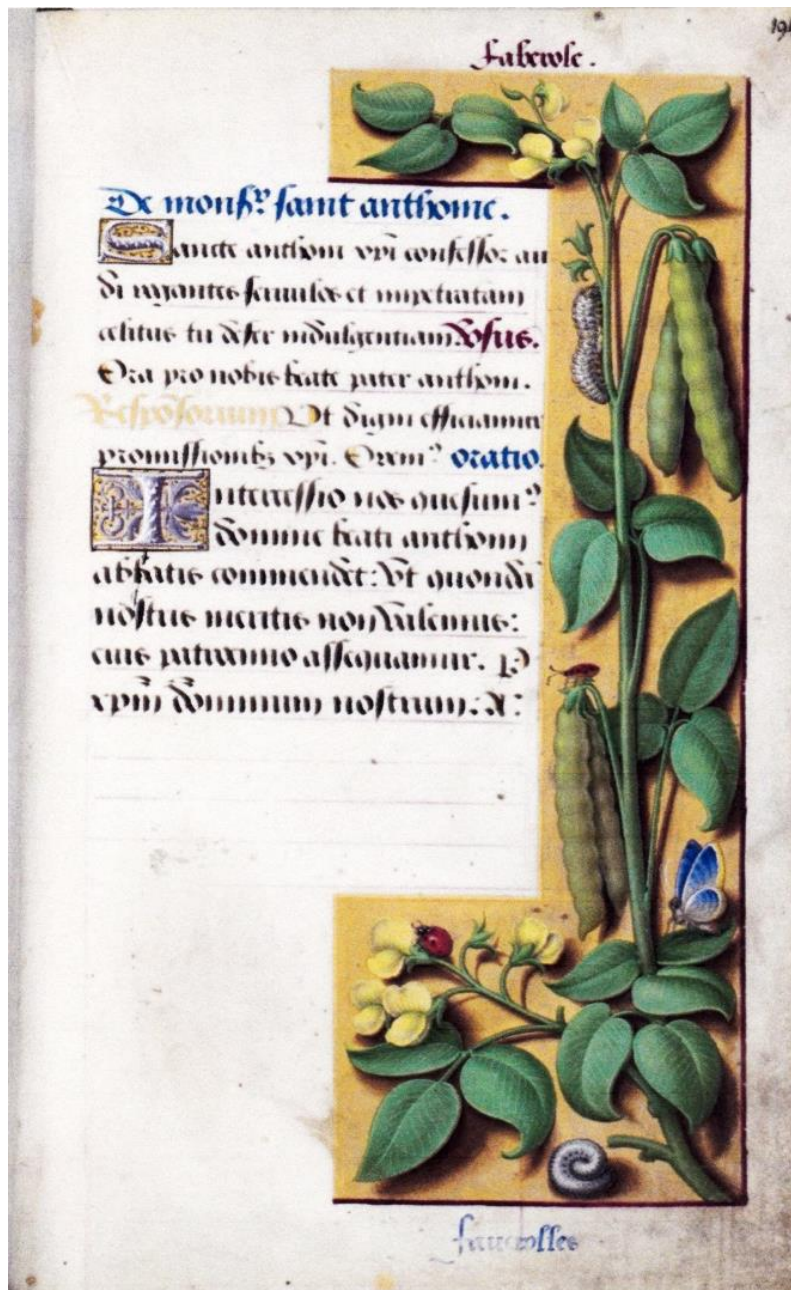


A.C. Zeven. 1997. The introduction of the common bean (*Phaseolus vulgaris* L.) into Western Europe and the phenotypic variation of dry beans collected in The Netherlands in 1946. *Euphytica* 94: 319-328.

Keywords: common bean, *Phaseolus vulgaris*, introduction history, garden form, phenotypic variation, The Netherlands



Horae ad usum Romanum dices Les Grandes Heures d'Anne de Bretagne, ca 1503-1508. Bibliothèque National de France, BnF MS 9474. Painter: Jean Bourdichon. <http://gallica.bnf.fr/ark:/12148/>

The common bean painted in France in 1508, 16 years after the first European visitors.

The introduction of the common bean (*Phaseolus vulgaris* L.) into Western Europe and the phenotypic variation of dry beans collected in the Netherlands in 1946*

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Received 24 September 1996; accepted 9 December 1996

Key words: *Phaseolus vulgaris*, common bean, garden form, landrace, phenotypic variation, The Netherlands

Summary

The first introduction of common bean from Central/South America into Western Europe most likely took place around 1500. The attractive bean seeds and their easy transportation warranted numerous additional introductions, not only from the Americas, but also from other areas where the common bean had been introduced. Bean seeds also must have been transported all over Europe both locally and internationally. Natural and human selection took place in and among introductions as well as in hybrid populations. Strong human selection may have led to pure garden forms which often occur in The Netherlands. In the period 1945–1948 a dry-bean collection of some 1500 accessions was made in The Netherlands. These have been classified into various criteria: 1. landraces, 'primitive' garden forms and cultivars, 2. (semi)climbing or bush types, 3. various seed colour types, including whitish, brownish, yellowish, black and variegated.

Introduction

Arrival in Europe

Little is known of the ways the dry bean and the French bean have been introduced into Europe in the past some five centuries. It is likely that over this long period many introductions were made from many places. We may assume that since some five centuries ago sailors and traders after visiting the Americas took the nicely coloured, easily transportable seeds of the common bean with them as a curiosity. Thus, already about 1508 the common bean was depicted in France (Camus, 1894). Within Europe one may expect that there was a quick distribution of seeds as curiosities. Seeds were planted and under suitable conditions, especially of

photoperiod, produced new seeds. Nowadays people still bring beans with them from neighbouring and far-away regions into Europe (and other continents). Such unrecorded seed exchanges in Europe must have happened since the first visits of Europeans to the Americas.

The first description of the common bean in European herbals is by Fuchs (1542, 1543), who reported that the common bean – the German name is 'Welsche Boonen' – is a climbing bean, that the flowers are white or red, and that the seeds are red or skin-coloured with black spots, liver-coloured with or without spots, snow-white, white-greyish or yellow. (The reference to white and red flowers could equally refer to *Ph. coccineus* L.) Roesslin (1550) also described the colour of the flower as white, palish yellow or red, and the seeds as red, skin-coloured with black spots, leather-coloured, white, grey, or golden yellow. In 1553 Oellinger depicted a common bean plant with brown seeds (see Brücher, 1988 for reproduction). Dodonaeus (1554), working in Flanders, referred to the crop as 'Roomsche Boonkens' (Dutch), 'Welsche Boonen'

* In this paper we will call accessions *landraces*, when grown as a field crop, unimproved accessions grown on a smaller scale will be named *garden forms*, and accessions improved by a breeder are *cultivars*. As most landraces were not cultivated anymore, most accessions of landraces came from genebanks or were cultivated in gardens becoming garden forms.

(German) and 'Phaseolis' (French). 'Roomsche' and 'Welsche' mean foreign. He also mentioned the climbing habit of the plant and the seed being kidney-shaped and coloured red, yellow, white, black, or variegated. The bean plants are grown in gardens and prefer good soil and sunny sites (Dodonaeus, 1521). No records of the common bean earlier than 1543 have been found in NW European herbals. For instance, Dodonaeus (1521) does not refer to this plant. This suggests that the common bean was distributed over NW Europe after around 1540. In 1669 the common bean was already cultivated on a large scale in the Dutch province of Zeeland, where 'complete fields' were sown with beans that did not need poles (Van der Groen, 1669). Van der Groen did not mention the seed colour of the landrace grown. Furthermore, all the present flower and seed colour variation was already existent in NW Europe at that time. This may not be the case for the plant habit, because Fuchs and Dodonaeus only refer to the climbing habit of the bean plant ('like a hop plant'), which may mean that at that time bush beans were not available. In later herbals the bush habit is also mentioned. Unfortunately, nothing is said about the seed size, which could have pointed to the area of provenance (see below).

After their introduction, nature selected primarily for tolerance to long days (Evans, 1973), disease and pest resistance, stress tolerance and ability to survive, whereas man selected for plant habit, seed colour, seed colour pattern, and also disease and pest resistance. Man could not have selected for yield capacity. If more was needed more plants were grown.

No information is available on the bean accession-*Rhizobium*-strain associations in the 16th century. The present European strains of various *Rhizobium* species can nodulate a genotypically wide range of the common bean (Amarger et al., 1994). It is supposed that this could have been the case also around 1500 and later. Furthermore, the plant collectors obviously have taken good care of their precious bean seeds by sowing them in their gardens with soil rich in nitrogen.

As indigenous bean landraces in the Americas are neutral, intermediate or sensitive to photoperiod (Singh et al., 1991; White & Laing, 1989; White et al., 1992) the daylength requirement may not have hampered the introduction into Europe and elsewhere. Some of the samples were adapted to the local photoperiod and survived, others were not and disappeared. This resulted in the occurrence of the present variation for photoperiod response of the common bean in The Netherlands. White & Laing (1989) investigated 15 Dutch acces-

sions for photoperiod response of flowering. They found that 5 were day-neutral, 4 were intermediate and 5 were sensitive. This small number of accessions does not allow us to draw more conclusions than that all three phenotypes occur in The Netherlands.

Small-seeded accessions were often used as French beans. However, in The Netherlands (and probably elsewhere) many French bean accessions may have a dual purpose and are also cultivated as dry beans like the accessions with large seeds.

Seed exchange

Much unrecorded seed exchange between plant collectors, gardeners, hobby-gardeners and farmers must have taken place since the first arrival of the common bean at a certain place. As travelling over longer distances increased so seed exchange took place over larger areas, especially by hobby-gardeners. A 50-year old, registered example of seed exchange of a bean accession over a short distance is given by Anon. (1949). The 'Leverkleurige boon' is not uncommon in the province of Groningen. A sample was taken from this province to the province of Zuid-Holland around 1920, where it was collected in 1946. The same is probably true for 'Blanca' in the province of Drenthe, which came from the province of Zeeland (see below). Peculiar bean types such as the 'Soldatenboon' (or 'Soldier bean') accessions (see below) may have attracted the attention of hobbyists and probably were frequently exchanged over short and long distances.

Seed exchange may recently have been promoted by the seed multiplication of cultivars by for instance Dutch bean breeders in East Africa and elsewhere. These breeders will certainly have brought back local material with them.

Races

The common bean has been domesticated in Central as well as South America (Gepts et al., 1986; Debouck & Smartt, 1995). Sauer (1950) mentioned that the Andean bean varieties have seeds which mostly are large and somewhat cylindrical, and that the black-seeded forms, are common in Mexico and Central America, and less common in South America. C.J. Pegington, using some 5000 accessions from Central and South America, probably independently, also established this relationship between the area of domestication and seed size (Evans, 1973). When more information became available more associations

between domestication centre and characters, such as seed shape, bracteole shape, phaseolin and allozyme patterns could be established (Singh et al., 1991).

The gene pools and races now recognized are (S.P. Singh, see Zeven et al., in prep.):

- Middle American: races Meso-America, Durango, and Jalisco.
- gene pool Andean: races Nueva Grenada, Chile, and Peru.

The present-day accessions would originally have come from either of the two regions, each identified by its own centre of domestication, viz. the 'Andean type' from South America and the 'Meso-American type' from Central America (Gepts, 1988), or derived from 'intra-' or 'inter-regional' hybrids.

Purity

Although breeding for major crops started in The Netherlands more than 130 years ago, only limited breeding existed for the common bean. Hence, it was possible to find unimproved dry bean forms in the home gardens of houses and farms in The Netherlands, even in 1975. Most of them have been 'inherited' from parents to children as these, according to the growers, 'were the best'. Within a garden the bean form is not a landrace as it often is genotypically pure. The cause of this purity is that the gardener cultivates only some 50–100 plants and after selecting a few healthy plants for the desired plant habit, seed colour and seed colour pattern he stores 2 to 5 plants during the winter in the garden shed. If the garden population initially was a mixture, the procedure of preserving only a few plants to obtain seeds for the next season together with the predominantly autogamous reproductive system will quickly lead to complete purity of a garden form, i.e. eventually the gardener keeps one homozygous genotype. Yield level was not a selection criterion; if a gardener needed more yield some more plants were grown. During the winter he and his family used to open the pods, clean the seeds, and select the desired ones.

In some areas in The Netherlands, such as the provinces of Groningen, Friesland and Zeeland, in addition to the cultivation of garden forms, landraces of dry beans were grown on a larger scale. In the provinces of Groningen and Friesland the landrace 'Groninger Strogele' (synonymous to 'Friese Woudboon'), in the province of North-Holland the 'Noord-Hollandse Bruine' and in the province of Zeeland, especially on the Walcheren island the white-seeded 'Walcherse Witte'

were grown. The latter landrace was cultivated until it was wiped out (see below). The larger the scale of cultivation the more the crop would have resembled a landrace, i.e. the less the purity. However, it is not known, whether this was the case indeed. 'Groninger Strogele' and 'Noord-Hollandse Bruine' became restricted to gardens, resulting in pure garden forms, while 'Walcherse Witte' was only preserved in genebank collections. Within a garden population of 'Groninger Strogele' various shades of yellow-brown may occur, but these shades could have been caused by environmental influences.

French bean garden forms, of which some are also grown for dry seed use (included in our collection), are probably purer than the form cultivated for the dry beans exclusively. The cause could be the close contacts between the fresh pod picker and each plant of his crop which may result in a marking of desirable plants during the picking season, and leaving some pods to produce seed to be kept. But the process of loss of genetic variation with years as described for the dry bean forms will certainly also have resulted in a reduction of the variation within each garden population.

Intergenotypic hybridisation

Although within a garden the dry bean population was quite uniform, the gardener often grew French beans as well. Their proximity may have resulted in cross-pollination. Cross fertilization of up to 8% has been observed between accessions with overlapping flowering periods (Free, 1970). Wells et al. (1988) found higher outcrossing rates, viz. up to 66.8%. Due to hybrid weakness hybridisation between 'Andean' and 'Meso-American' accessions may have occasionally reduced gene transfer between these regional races.

Furthermore, it is assumed that gardeners were regularly trying out new bean types during the past 500 years. Such new bean types may have derived from new introductions and from hybridisation. This may have resulted in the cultivation of new genotypes and phenotypes. Despite hybrid weakness between some accessions of 'Andean' and 'Meso-American' origins (Singh & Gutierrez, 1984), their genomes may have become mixed. No oral or written information is available to support the above claim. However, present material obtained from one person gave interesting information. Among his material intermediate resistance to leafhopper (*Empoasca fabae* Harris) occurred; his 'Citroenboon' accession 4.33 scored an I (= intermediate resistance), whereas all other 'Citroenboon' accessions

appeared susceptible (Zeven et al., in prep.). Among other material also his 'Bruine Soepboon' (acc. 2.38) was resistant. Maybe, his 'Citroenboon' (acc. 4.33) is a derivative of a cross between this 'Bruine Soepboon' (acc. 2.38) or another resistant accession on the one hand, and a susceptible 'Citroenboon' accession on the other. The 'Citroenboon' accessions were classified by Singh (Zeven et al., in prep.) as belonging to the Meso-American genepool, whereas Singh could not identify the genepool of acc. 4.33. Maybe, because it is an inter-genepool hybrid.

An off-type of 'Walcherse Kogelboon' with a longer seed, was described as derived from hybridisation (Anon., 1949). Gardeners may also have been attracted by peculiar types such as the 'Soldatenboon' with its reddish, brownish or blackish sign around the hilum (see below). If grown as a curiosity it may have hybridized with the home-grown garden form.

Phenotypic variation within The Netherlands

In The Netherlands various unimproved bean garden forms may be grown by a gardener. However, the phenotypic variation within a garden form is low. In the period 1946–1949 an investigation of this variation was made by Nijdam (1947) and by Anon. (1949, the author also is Nijdam; Zeven, 1979). Nijdam collected and described the variation of some 1500 landraces and garden forms of dry bean collected in The Netherlands in 1945–1946. He made the following classification:

1. White beans. In the province of Noord-Holland the form 'Krombek' with its white, kidney-shaped seeds is still grown. As already mentioned, on the Walcheren island, province of Zeeland, 'Walcherse Witte' is being grown. The cultivation was not easy as in a rainy harvest period the shiny white beans would become yellowish or would become darkly stained. This bean form yielded some 1500 to 2500 l/ha (Gerlach, 1885). In the province of Limburg many types are white-seeded. They resemble the 'Krombek' form. Other white-seeded Krombek-forms in the provinces of Limburg and Noord-Brabant are 'Eenboon'. In this province 'Pijpestrootje' (syn. 'Portugezen') beans were also cultivated. This form is similar to the 'Krombek'-type as its seeds are thin and straight. The 'Witte Eiboon' occurs in the provinces of Limburg and Noord-Brabant and the river areas of the province of Gelderland. This name is a trade name, referring to a certain seed shape, which may derive from different garden

forms. Consequently, within 'Witte Eiboon' various types were observed. In the eastern part of the province of Drente a rare, white-seeded type named 'Blanca' is found. It resembles 'Walcherse Witte'. It could have been brought there by immigrants from the province of Zeeland. For instance, families from Westkapelle, Walcheren, in the province of Zeeland moved in 1844 to the province of Drente (Bontekoe, 1952). In some places where descendants are living we could find this 'Blanca' type of bean. (The registered cultivar Blanka is a different variety.)

According to Gepts & Bliss (1988) 'Walcherse Witte' (acc. 1.04) has the phaseolin S-phenotype which points to a Central American origin. They observed that 'Krombek' (acc. 1.01), 'Eiboon' (acc. 1.02), and 'Dikkontjes' (acc. 1.34) possess the phaseolin T-phenotype, which points to an Andean origin.

As already stated, in the province of Zeeland the 'Walcherse Witte' had almost disappeared in 1947. The cause was the large-scale, long-lasting inundation during World War II (Nijdam, 1947) and a possible increase of a virus disease generated by the newly introduced cultivation of virus-infected gladioli (H. Lamberts, pers. comm. 1975). In 1949 it was difficult to obtain sufficient sowing seed even for experiments (Anon., 1949). As most people of this province do not consume dry beans 'Walcherse Witte' was also not conserved in home gardens.

2. Brown beans. Among the 'Bruine kogelboon' we find garden forms such as 'Kleine Krobbe' and 'Noord-Hollandse Kleine Bruine'. From this material the cultivar Aka was obtained.

The ochre-brown garden forms can be separated into 'Noord-Hollandse Bruine' and its selection 'Beka', and 'Zeeuwse Bruine' and its selection 'Ceka'. 'Zeeuwse Bruine' yielded some 2500 to 3500 l/ha (Gerlach, 1885). Already in 1946 the landrace 'Zeeuwse Bruine' had disappeared from Zeeland. The many samples obtained by Nijdam, and described under this name, derived very likely from 'Ceka' (Anon., 1949). Dark-brown garden forms are also grown as French bean. The 'Chocolade Bruine Rotje' and 'Rattekeutels' also belong to the brown-seeded types. 'Berna' is an improved variety registered in 1959. It is a derivative of the cross Ceka/Red Mexican 34/Ceka/3/Beka. It resembles 'Beka'. Two accessions of 'Berna' (accs 2.01 and 2.02-1) and five accessions of 'Aff. Berna' (accs 2.05, 2.06, 2.07, 2.11, 2.16) possess the phaseolin T-phenotype (Gepts & Bliss, 1988), which points to an Andean origin. The same holds

for the four accessions of 'Kogelboon' (accs 2.02-2, 2.03, 2.08, 2.09), 'Noordhollandse bruine' (acc. 2.04), 'Chocolade bruine boon' (acc. 2.15), and 'Rattekeutel' (acc. 2.23).

The *Liver-coloured beans* were rarely obtained. One accession possesses the phaseolin T-phenotype (Gepts & Bliss, 1988), which points to an Andean origin.

3. *Variiegated beans*. In trade one finds mainly the 'Kievitsboon' with its purple streaks and spots on a whitish background and rarely with whitish spots on a purple background. This form occurs especially in the provinces of Gelderland, Utrecht and Noord-Brabant. The 'Kievitsboon' is divided into big- and small-seeded forms. The big-seeded type has a red flag and white wings and dark coloured spots on the pods. The 100-seed weight is ca 70–75 g. The small-seeded type has a violet flag, pale violet wings, pale spots on the pods and a 100-seed weight of ca 40–45 g.

A rare type is the climbing 'Kievitsboon', which was formerly cultivated as a wind break in the tobacco regions of the provinces of Gelderland and Utrecht. Hence their name 'tabaksboon'. Of course, this type also yielded beans for consumption and cash. When the cultivation of tobacco stopped in the first half of the present century this pole bean type also disappeared. Only around the village of Roelofarendsveen, province of Zuid-Holland, was this type of bean found. It was grown there to protect the vegetables from wind damage (and to produce beans). 'Kievitsboon' accessions, according to Anon. (1949), are susceptible to anthrac-nose. This may point to a common origin. 'Transvaalse' is a small-seeded type with purple spots and streaks on a pale purple background. It is suggested that it is especially grown in the Gelderse Vallei area (boundary region of the provinces of Utrecht and Gelderland), because it has resistance to botrytis (N. Hubbeling, pers. comm. 1975). Some selections are called 'Transvaalse Bonte' or 'Vroege Roodbonte Prinses'. These are used as French beans. However, several accessions with the names 'Transvaalse Bonte Met Draad' (from Transvaal variegated with string) or 'Transvaalse Bonte Zonder Draad' (from Transvaal variegated without string) were obtained. Whether the indication Transvaal of these garden forms refers to Transvaal, South Africa or not, is not known. Gepts & Bliss (1988) observed that 'Transvaalse Bonte Met Draad' has the phaseolin phenotype S, pointing to a Central American origin as does the small seed size.

Other forms were 'Platte Bonte Ranker', 'Renka' (acc. 3.05), 'Grootzadige Kievitsboon' (acc. 3.07), 'Grootzadige Kievitsboon' (acc. 3.08), 'Kleinzadige Kievitsboon' (acc. 3.12), 'Macedonische Boon' (acc. 3.21), 'Stokkievitsboon' (acc. 3.22), 'Roodbonte Krobbe' (acc. 3.23) and 'Rode Kievitsboon' (acc. 3.33), which all possess the phaseolin T-phenotype Gepts & Bliss (1988) suggesting an Andean origin of this type of bean.

4. *(Straw)yellow/yellowish brown beans*. Especially in the province of Noord-Holland the yellow-seeded 'Citroenboon' with its selection 'Blokkerboon' is found. The straw-yellow seeded 'Groninger Strogele' (syn. 'Friese Woudboon') has already been mentioned. Informants suggested to Nijdam that the accessions from Friesland had smaller seeds than those from the province of Groningen. This difference could not be confirmed by Nijdam (1947), but it could by Anon. (1949). The cause of this regional difference is not presented. 'Citroenboon' (acc. 4.01) possesses the phaseolin T-phenotype (Gepts & Bliss, 1988), indicating its Andean origin.

5. *Soldatenboon*. 'Soldier bean' has highly variable spots around the hilum. Such spots could sometimes be explained as a soldier standing at attention. Hence its name. A synonym is 'Huzarenboon' (hussar bean). In other cases the spots do not resemble a 'soldier' and hence the name 'Tekensboon' (sign bean). This bean is also called 'Heilige Geestboon' (Holy Ghost bean) (Drijfhout, 1978).

6. *Black beans*. Despite their colour this seed type is also grown as a dry bean type. Various names are 'Wasboon' (wax bean), 'Boterboon' (butter bean) and 'Spekboon' (bacon bean). These names refer to the yellowish pod colour of these types.

Phaseolin genotypes

Gepts & Bliss (1988) investigated 30 accessions for their phaseolin genotype. Twenty-eight of them have the T-phenotype, while only two accessions have the S-phenotypes. This points to a great uniformity for the phaseolin of the dry bean accessions grown in The Netherlands, and to South America as a possible major region of provenance.

Association of bean type and region

Nijdam (1947) pointed out that there is an association between bean type and region. So we find 'Groninger Strogele'/'Friese Woudboon' mainly in the northern provinces of Groningen, Friesland and Drente, while the 'Krombek', 'Citroenboon', the 'Noord-Hollandse Bruine' occur in the province of Noord-Holland. The same is true for 'Walcherse Witte' on Walcheren Island, province of Zeeland, and 'Kievitsboon' in the province of Gelderland (see Zeven, 1979, for distribution map).

White-seeded beans may be at a disadvantage, because of their possible association with pre-emergence diseases such as *Rhizoctonia solani* Kuhn causing pre-emergence damping-off (Prasad & Weigle, 1976; Dickson & Petzoldt, 1988). Similarly, with dwarf French beans, Powell et al. (1986) observed a lower rate of field emergence in white-seeded accessions (67%) than in black- and brown-seeded accessions (91%). Temple & Morales (1986) observed a strong genetic linkage between the I⁺ allele (sensitivity to bean common mosaic virus) and the locus for the red-mottled seed, and between the I allele (tolerance to BCMV) and the locus for purple-mottled seed. Although Smartt (1988) mentioned that in regions with oceanic climates the wet harvest conditions would be disadvantageous to white-seeded beans, such an association could not be established in The Netherlands. Many white-seeded types grow in the coastal regions, such as the 'Walcherse Witte' landrace, and the 'Krombek' garden forms of the province of North-Holland. Maybe, any disadvantage of white seed colour is counteracted by a higher seed rate in fields and gardens.

It is suggested that common bean is cultivated in The Netherlands on a larger scale especially in areas with large water surface at the west side. Because of the dominating western wind the influx of virus-infected aphides is limited. So we find beans growing in the provinces of Zeeland, Zuid- and Noord-Holland with the North Sea as west border. Formerly, this may also have been true for parts of the regions north-east of the former Zuiderzee. This would mean that in these areas no natural selection for virus tolerance occurs. Hence, we may find there tolerant, intermediate and sensitive accessions, whereas in other areas (with natural selection for BCMV tolerance) one would find mainly tolerant accessions. This is, however, not the case (Zeven et al., in prep.). Therefore, the very sensitive landrace 'Walcherse Witte' (Drijfhout, 1978) could be grown in the province of Zeeland.

Present collection

As the Nijdam-collection was not preserved a new collection was made (Zeven, 1979). This resulted in 229 accessions. After removing 10 *Ph. coccineus* L. accessions and dividing 4 accessions each into two sub-accessions 223 accessions were obtained (Appendix 1). It was observed that the geographical distribution of seed colour as described above was still present. For instance, a 'Blanca'-accession was still obtained from Dalen, East Drente. This shows that the home growers still prefer their own material. In addition to apparently unimproved material we also received material which probably was derived from improved cultivars. In many cases the cultivar name was not given as with passing years and with seed exchange these names were lost. As breeding work of dry-seed bean in The Netherlands is concentrated on brown-seeded beans we may expect that among this seed type and in addition to the named cultivars some accessions of unidentified cultivars will be present. This collection was investigated for its phenotypic variation and for association between accessions (Zeven et al., in prep.).

In addition to the *Ph. vulgaris* accessions the 10 (climbing) *Ph. coccineus* L. accessions were included in genebanks.

Acknowledgements

I am grateful to Prof. Dr. J.G.Th. Hermsen (Wageningen) and Dr. P. Gepts (Davis) for reading and commenting an early draft.

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Appendix 1. Collection of landraces, garden forms and cultivars of the common bean made in The Netherlands

Code name	Provenance site/person
White-seeded beans	
1.01 Krombek	Schoonebeek
1.02 Eiboon	Eindhoven
1.03 Walcherse Witte (pole)	Gatersleben
1.04 Walcherse Witte Blanka (pole)	Gatersleben
1.06 Eiboon	Zevenbergschehoek
1.07 Krombek	Zwaan
1.08* Krombek	Tubergen
1.09 Krombek	Willemse
1.10* Krombek	van Namen
1.11 Krombek	IVT
1.12 Krombek	Sluis & Groot
1.13 Krombek	LU-LPT
1.14* Prelude Stamboon	LU-LPT
1.16 Eiboon	Brielle
1.18 Eiboon	Brielle
1.19 Eiboon	Beusichem
1.20* Walcherse Witte	IVT ex province Zeeland
1.21 Schabenause	Renkum
1.22 Krombek 1	Abbekerk
1.23 Krombek 2	Abbekerk
1.24 Eiboon	Andijk
1.25 Krombek	Andijk
1.26 Eiboon	Dalen
1.28* Krombek	Dalen
1.29* Krombek	Dalen
1.31 Knobbelboon	Roggel
1.32 Kookboon	Baarlo
1.33 Wit-rood Boon	Barneveld
1.34 Dikkontjes	's-Gravenhage
1.36* Witte Platte Stokboon	Barneveld
1.37 Wit Boontje	Barneveld
1.38* Witte Stokboon	Dinxperloo
1.39* Witte Boon (Duitse Prinses)	De Lier
1.41* Walcherse Witte	LU-LPT ex province Zeeland
1.43 Witte Polboon	Appeltern
1.44 Wit Suikerboontje	Appeltern
1.45 Witte Boon	Oirschot
1.46 Kaboon	IPO
1.47 Witte Droge Slaboon	Bathmen
1.48 Hardschillige Witte	Rockanje
1.50 Wulleboon	Vaals
1.51 Stokboon	Vaals
1.52 Stoksoepboon	Vaals
1.53 Eiboon	Beneden-Leeuwen
1.55 Witte Boon	Venray
1.56 Witte Sabelboon	Venray
1.57 Witte Boon	Venray
1.58* Veense Snijboon	Venray
	French bean, syn. Vroege Veense (RLG, 1943)
1.59 Witte Boon	Eindhoven
1.60 Eiboon	Venray
1.64 Kookboon	Venray
1.65 Soepboon	Venray
1.66 Snijboon	Venray
1.69 Soepboon	Venray
1.70* Princesse Boon	Venray
1.71* Veense Snijboon see 1.58	Venray
1.72 Soepboon	Venray
1.76 Fijne Kleine Boon	Wassenaar
1.77 Eiboon	Nijkerk
1.78* Franse Prinses	Beneden-Leeuwen
1.79 Witte Boon	Ubachsberg
1.80* Riesenboontje	Eijs
	Maybe syn. to Hinrichs Reuzen (see 1.85)
1.84 Witte Aka	Vrouwenpolder
1.85* Hinrichs Reuzen	Groningen
	French bean, syn. Hinrichs Riesen, Witte Reuzen (RLG, 1943)
1.86* Snijboon	Nederhorst-Ten Berg
1.87 Eiboon (knobbel)	Kesteren
1.88* Groninger Weekschil	Groningen via Wageningen
	French bean, but also suitable as dry bean, slightly susceptible to diseases (RLG, 1943)
1.89 Witte Stamboon	Avenhorn
1.90* Stokprinses	Eefde
Brown-seeded beans	
2.01 Berna	IvP
2.02 1 Berna	LU-LPT
2.02 2 Kogelboon	LU-LPT
2.03 Kogelboon	IvP
2.04 Noordhollandse Bruine	Zwaan
2.05 aff. Berna	Tubergen
2.06 aff. Berna	Willemse
2.07 aff. Berna	van Namen
2.08 Kogelboon	Sluis
2.09 Kogelboon	Barneveld
2.10 Aka	LU-LPT
	Aka has been described as having a short pod (Anon., 1949)
2.11 aff. Berna	Willemse
2.12 Beka	IVT
2.13 Ceka	IVT
2.16 aff. Berna	Brielle
2.17 aff. Berna	IvP
2.18 aff. Berna	Abbekerk
2.19 Aka	Cebeco
2.20 aff. Berna	Dalen
2.21 Dikpenskes	Bafo
2.22 Kogelboon	Walcheren

2.23* Rattekeutel, see 2.43	Barneveld	3.22 Stokkievitsboon	Prakken
2.24 Rotters maybe syn. to 2.43	Voorthuizen	3.23 Roodbonte Krobbe	Prakken
2.25 Koffiebruine Boon	Vlaardingen	3.26 Kleinzadige	Kootwijk
2.27 Havannabruine Boon	Beilen	3.27 Stokkievitsboon	Andijk
2.28 Kogelboon	Emmeloord	3.28 Kleinzadige	Voorthuizen
2.30 Bruine kogelboon	Arnhem	3.29 1 Grootzadige	Dieren
2.31 Bruine Boon	Bathmen	3.29 2 Grootzadige	Dieren
2.33 Bruine Boon	West-Friesland	3.30 Rode Krobbe	Molenend
2.34 Bruine Boon	Bathmen	3.32 Grootzadige	Wageningen
2.35 Moddermannen	Rockanje	3.33 Rode Kievit	Castricum
2.36 Bruine Boon	Bathmen	3.34 Stokkievitsboon	Arnhem
2.37 Noordhollandse Bruine	Beneden-Leeuwen	3.35 Kievitsboon	Druuten
2.38 Bruine Soepboon	Venray	3.36 Kievitsboon	Batenburg
2.39 Bruine Soepboon	Venray	3.39 Renka	IPO
2.40 Kennemer Bruine	Breezand	3.41 Kievitseitjes	Rockanje
Maybe identical to the improved variety Kennemer with ochre-brown seeds. This variety is moderate resistant to halo blight, BCMV and susceptible to anthracnose		3.42 Roodbruine Kievit	Rockanje
		3.43 Bruine Kievit	Rockanje
		3.44 Bruin Gevlekte Moddermannen	Rockanje
2.41 Grauwe Boon	Breezand	3.45 Kievitsboon	Steenwijk
2.42 Bruine Boon	Breezand	3.46 Kievitsboon	Dalfsen
2.43 Chocolade Bruine Boon	Breezand	3.47 Kievitsboon	Dalfsen
syn. (Chocolade) Bruine Rotjes, Rattekeutels. Slightly susceptible to (not specified, ACZ) diseases (RLG, 1943)		3.51 Stokkievitsboon	Dorenbosch
2.44 Chocolade Bruine Boon	Cebeco	3.52 Stokkievitsboon	Aalsmeer
see 2.43		3.53 Transvaalse Bonte	Aalten
2.45 Kogelronde Bruine Boon	Wageningen	French bean, but suitable as dry bean (RLP, 1943)	
2.46 Bruin Boontje	Domburg	3.54 Kleine Krobbe	Aalsmeer
Kievitsboon		3.55 Speksnijboon	Ubachsberg
3.01 Grootzadige	Zwaan	3.57* Gieterse Slaboon	Gieten
3.02 Grootzadige Paars	Tubergen	3.58 Kievitsboon	Zuid-Holland
3.03 Grootzadige	van Namen	3.59 Breezandse Boon	Breezand
3.04 1 Grootzadige	Wouda	3.60 Kievitsboon	Batenburg
3.04 2 Kleinzadige	Wouda	Citroen and (straw)yellow	
3.05 Renka	IVT	4.01 Citroen	Prakken
3.07 Grootzadige	Wageningen	4.02 Citroen	LU-LPT
3.08 Grootzadige	Wageningen	4.03 Citroen	Zwaan
3.09 Grootzadige (darker)	Wageningen	4.04 Citroen	van Namen
3.10 Grootzadige	Wageningen	4.05 Citroen	de Nijs
3.11 Renka	LU-LPT	4.06 Strogele	IVT
3.12 Kleinzadige	Prakken	4.07 Strogele	LU-LPT
3.13 Transvaalse Bonte Met Draad	LU-LPT	4.08 1 Strogele	Koopman
3.14 Grootzadige	Nieuwe Wetering	4.08 2 Strogele	Koopman
3.15 Grootzadige	Nieuwe Wetering	4.09 Strogele	Koopman
3.16 Grootzadige	IvP	4.10 Strogele	St. Johannesga
3.17 Stokkievitsboon	Nieuwe Wetering	4.12 Strogele	Siddeburen
3.18 Stokkievitsboon	Hoogmade	4.13 Strogele	Winschoten
3.19* Transvaalse Bonte Met Draad	IVT	4.14 Citroen	Spitters
French bean, but suitable as dry bean (RLG, 1943)		4.15 Strogele	Groningen
3.20* Transvaalse Bonte Zonder Draad	IVT	4.16 Citroen	Andijk
French bean, but suitable as dry bean (RLG, 1943)		4.17 Strogele	Dalen
3.21 Macedonische Boon	LU-LPT	4.19* Slaboon	Barneveld

4.20* Wagenaar Slaboon	Wageningen
French bean, syn.	Met Draad 14 cm
Vroege Wagenaar	pod length
	Zonder Draad 12 cm
	pod length
Very/moderate tolerant to BCMV and BYMV, moderate susceptible to ascochyta blight, almost resistant to anthracnose (RLG, 1943)	
4.21 Gele Boon	Apeldoorn
4.22 Gele Boon	Veenoord
4.23 Gele Boon	Miedema
4.24 Gele Boon	Schoonoord
4.25 Beige Gele Boon	Duitsland
4.26 Gele Krobbe	Castricum
4.27 Gele Boon	Veendam
4.28 Gele Boon	West Friesland
4.29 Gele Citroenboon	Rockanje
4.30 Strogele	Veendam
4.31 Strogele	Wiersma
4.32 Gele Boon	Oostwold
4.33 Citroenboon	Venray
4.34 Gele Boon	Dorenbosch
4.35 Gele Boon	Oosterhesselen
4.36 Strogele Boon	Veendam
4.37 Strogele Boon	Bergumermeer
4.38 Strogele Boon Salvia	Cebeco
4.39 Strogele	Groningen-Joordens
4.40 Geelbruine (with a purple pod)	Kesteren
4.41 Strogele	
Soldatenboon	
5.01 1 Bruine Soldaat	Silvolde
5.01 2 Rode Soldaat	Silvolde
5.02 Rode Soldaat	NAK

5.03 Rode Soldaat	Prakken
5.04 Bruine Soldaat	Rouveen
5.05 Bruine Soldaat	De Bilt
5.06 Bruine Soldaat	Krimpen a/d IJssel
5.07 Bruine Soldaat	H.I. Ambacht
5.08 Kleine Bruine Soldaat	Drente
5.09 Bruine Soldaat	Schouten

Black-seeded beans

6.01* Wasboon	IVT
6.02* Zwarte Belgische	IVT
6.03 Markusboon	Zelderheide
6.04 Grote Zwarte	Woubrugge
6.05 Zwarte Boon	Appeltern
6.06 Moortje	Rockanje
6.07 –	
6.08* Wasboon	Ubachsberg
A black-seeded Wasboon cultivar has been described in RLG (1943) as Wasboon Mont d'Or without string, with the characters quite susceptible to anthracnose and Ascochyta blight, slightly susceptible to halo blight, and slightly sensitive to BCMV and BYMV	
6.09* Wasboon,	Venray
see 6.08	
6.10* Wasboon,	Venray
see 6.08	

Other

7.01 Porcelainboon	Rockanje
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*(semi)climbing accession, IPO = Institute of Plant Pathological Research, now IPO-DLO. IVT = collection of former Institute for Horticultural Plant Breeding, Wageningen, now part of CPRO-DLO. IU-LPT = Dept. of Agronomy of the Agricultural University. NAK = General Netherlands Inspection Service for Agricultural Seeds and Seed Potatoes.