

# Pea breeding programmes in the Czech Republic

Miroslav Hochman<sup>1\*</sup> and Radmila Dostálová

## Abstract

In 2010 the Czech acreage cultivated with grain legumes was 31318 ha. The most important grain legumes were peas, followed by soybeans, lupins and faba bean. While peas showed a dramatic decrease in acreage over recent years soybeans significantly increased in their acreage. An important share of the Czech pea production is exported, either as feed or as seed. Breeding of peas has a long history in the Czech Republic. Today three companies are engaged in pea breeding, i.e. Semo s.r.o., Selgen a.s. and Agritec Ltd. Breeding activities of the three companies are outlined.

## Keywords

Field pea, grain legumes, *Pisum sativum*, vegetable

## Introduction

In 2010 the Czech acreage cultivated with grain legumes was 31318 ha which represents 1.3% of the arable land. The most important grain legumes were peas (24400 ha; 23 dt ha<sup>-1</sup> average yield), soybeans (9472 ha), lupins (2097 ha) and faba bean (800 ha). While peas showed a dramatic decrease in acreage over recent years soybeans significantly increased in their acreage. An important part of the Czech pea production is exported, either as feed (14777 t to Poland and Germany) or as seed (2900 t to Austria, Germany and Poland). Breeding of peas has a long history in the Czech Republic.

## Pea breeding

Semo s.r.o. (www.semo.cz) Smržice u Prostějova, was founded in 1994 but has more than 50 years of breeding tradition as follow-up company of the former Vegetable Breeding Station. Semo is breeding varieties for European conditions and their varieties are popular not only in the Czech Republic, but also in Slovakia, Poland and Hungary. Besides green peas breeding is also carried out for pepper, tomato, cucumber, root vegetables and lettuce. The most popular green pea variety is Oskar which is characterised by very early maturity, long pods, large seeds and high yield. Oskar is suitable for mechanized harvest and hand harvest, and it is resistant to *Fusarium oxysporum* race 1.

Breeding activities of Selgen a.s. (www.selgen.cz), Praha, started in 1903 and since then hundreds of varieties of field crops were released. Concerning field peas 35 varieties were released since 1978 in various European countries and

in Canada. Among them was the popular variety Bohatýr (1980) which is still registered and cultivated in some European countries.

Agritec Research, Breeding & Services Ltd., Šumperk, is the follow-up of the former Research and Breeding Institute for Technical Crops and Grain Legumes (1945-1977) and the OSEVA Seed and Breeding Enterprise (1977-1994). Agritec's main activities are the maintenance of genetic resources of grain legumes, flax/linseed and hemp; genetics, breeding methods and biotechnology of grain legumes, flax and winter rape; agrotechnology of pea, faba bean, lupin, flax, hemp and caraway; integrated plant protection of grain legumes and flax; services (testing of pesticides, germplasm etc.) and the trading of pesticides, seeds, linseed, etc. The breeding aims in field peas are: resistance to lodging (*afila* type), high protein content (>23%), green or yellow colour, round seed shape, low content of trypsin inhibitor activity (TIA) (<9 TIU, trypsin inhibitor units).

The breeding goals in green peas are: optimal green colour, size and shape of seeds, high content of resistance starch (DOSTÁLOVÁ et al. 2009), high content of vitamins and carotenoids (luteins,  $\beta$ -carotene) (HOLASOVÁ et al. 2009). For both field peas and green peas resistances against fungal (*Erysiphe pisi*, *Fusarium* spp., *Ascochyta*, *Uromyces*) and viral pathogens (PEMV, PSbMV) are important. Agritec holds a collection of pea genetic resources (1280 accessions) and a core collection of peas which was established by both morphological evaluation and DNA analysis (SMÝKAL et al. 2008). Genetic resources are routinely used in e.g. the resistance breeding to powdery mildew (*Erysiphe pisi*) which is a serious disease and can cause yield losses of 10-65% by significantly reducing the seed weight (ONDŘEJ et al. 2003). Resistance is controlled by the recessive genes *er1* and *er2*. Sources of resistance are hybridized with susceptible varieties and selection of resistant plants in the progenies is carried out under artificial inoculation in the greenhouse. In the last decade breeding for horizontal resistance to *Fusarium* wilt caused by *Fusarium oxysporum* race 1 and 2 was the main aim of Czech breeding programmes (ONDŘEJ et al. 2008). Selection for *Fusarium* resistance was done under artificial inoculation by growing plants in agropellets, cutting off one-third of the roots and submerging the plants into a mixed inoculum of race 1 and 2. Moreover, screening methods were developed for *Ascochyta* blight (*Ascochyta pisi*) and virus diseases (Pea Enation Mosaic Virus, PEMV, and Pea Seedborne Mosaic Virus, PSbMV). Molecular markers were established for the *sbm-1* and *sbm-2* locus (resistance against PSbMV) (SMÝKAL et al. 2010).

<sup>1</sup> Agritec Plant Research Ltd., Zemedelská 16, CZ- 78701 ŠUMPERK

\* Correspondence: Radmila DOSTÁLOVÁ, dostalova@agritec.cz

Breeding work on a molecular level is also carried out by genetic transformation in regard to virus resistance, and the resistance against insect and fungal pathogens.

Peas are tested in field trials at 12 locations and in lab and greenhouse conditions. Criteria for registration are: grain yield, resistance to lodging, resistance to complex root rot, content of nitrogen (protein) and content of TIA. At the moment 39 cultivars are registered in the National List 2010 (ÚKZÚZ 2010), but only 11 pea varieties are on the Czech Recommended List of Varieties 2010.

## Literature

- DOSTÁLOVÁ R, HORÁČEK J, HASALOVÁ I, TROJAN R, 2009: Study of resistant starch (RS) content in peas during maturation. *Czech J. Food Sci.* 27, S120-S124.
- HOLASOVÁ M, DOSTÁLOVÁ R, FIEDLEROVÁ V, HORÁČEK J, 2009: Variability of lutein content in peas (*Pisum sativum* L.) in relation to the variety, season and chlorophyll content. *Czech J. Food Sci.* 27, S188-S191.
- ONDŘEJ M, DOSTÁLOVÁ R, TROJAN R, 2008: Evaluation of virulence of *Fusarium solani* isolates on pea. *Plant Prot. Sci.* 44, 9-18.
- ONDŘEJ M, DOSTÁLOVÁ R, HÝBL M, ODSTRČILOVÁ L, TYLLER R, TROJAN R, 2003: Utilization of afila types of pea (*Pisum sativum* L.) resistant to powdery mildew (*Erysiphe pisi* DC.) in the breeding programs. *Plant Soil Env.* 49, 481-485.
- SMÝKAL P, HORÁČEK J, DOSTÁLOVÁ R, HÝBL M, 2008: Variety discrimination in pea (*Pisum sativum* L.) by molecular, biochemical and morphological markers. *J. Appl. Genet.* 49, 155-166.
- SMÝKAL P, ŠAFÁŘOVA D, NAVRÁTIL M, DOSTÁLOVÁ R, 2010: Marker assisted pea breeding: *eIF4E* allele specific markers to *pea-seedborne mosaic virus* (PSbMV) resistance. *Mol. Breed.* 26, 425-438.
- ÚKZÚZ, 2010: National list of varieties. Bulletin of the Central Institute for Supervising and Testing in Agriculture, Series: National Plant Variety Office. Czech Gazette for Plant Breeders Rights and National List of Plant Varieties IX/S, 15 June. Ústřední kontrolní a zkušební ústav zemědělský, Brno. [Available online: <http://www.ukzuz.cz/Articles/33504-2-Bulletins+of+UKZUZ.aspx>; accessed 1 Mar 2011].