ASSESSMENT OF GERMINATION CAPACITY OF PEA SEEDS UNDER THE INFLUENCE OF STORAGE TIME

EVALUAREA CAPACITĂȚII DE GERMINARE A SEMINȚELOR DE MAZĂRE SUB INFLUENȚA DURATEI DE PĂSTRARE

CĂRBUNE R.V.[1], MIHALACHE G.[1], STOLERU C.M.[2], TELIBAN G.C.[1], COJOCARU A.[1], STOLERU V.[1*]

[*]Corresponding author e-mail: vstoleru@uaiasi.ro

Abstract. *The present paper highlights a study on the influence of storage time on the germination capacity of three cultivars of pea seeds. The determination of the germination capacity of pea seeds was carried out in accordance with the standards for Pisum sativum* L. *seeds, aged two and three years, respectively. The number of normally developed germs has been steadily declining for seeds since 2017 in all cultivars, but the highest loss of germination was analyzed at Meraviglia (38.3%) and Gloriosa (31.7%) cultivars. Research has shown that the seeds of all cultivars, after two years of storage, are in accordance with national and international standards, but the highest value of germination was at Kelvedon Wonder in 2018, respectively 100%.*

Key words: *Pisum sativum*, germination, seed storage conditions

Rezumat. *Lucrarea de față a avut ca scop să evalueze capacitatea de germinare la semințele a trei cultivare de mazăre de grădină sub influența duratei de păstrare. Determinarea capacității de germinare a semințelor de mazăre s-a efectuat în conformitate cu standardele în vigoare, pentru semințele de Pisum sativum, cu o vechime de doi, respectiv trei ani. Numărul germenilor dezvoltați normal s-a redus constant pentru semințele din anul 2017, la toate cultivarele, însă cea mai mare pierdere a germinației s-a înregistrat la cultivarele Meraviglia și Gloriosa. Cercetările au scos în evidență că semințele de la toate cele trei cultivaruri, după doi ani de păstrare, sunt în conformitate cu standardele naționale și internaționale, însă valoarea cea mai ridicată a germinației a fost la Kelvedon Wonder din anul 2018, respectiv 100%.*

Cuvinte cheie: *Pisum sativum*, condiții de păstrare, germinație totală

INTRODUCTION

Garden pea (*Pisum sativum* L.) is a cosmopolitan species, known for green beans and less for pods (Atanasiu and Atanasiu, 2000). In the crops of our country, garden peas or green peas are grown only by direct sowing, using high quality seeds, in order to achieve sustainable harvests (Stan *et al*., 2003; Ciofu *et al*., 2004).

The term "*quality seed*" is defined, on the one hand, by the growing demands of end-users of seed, and on the other hand by the evolution of legislation and standards in the field, which set the minimum requirements to be

[1]"Ion Ionescu de la Brad" University of Life Sciences, Faculty of Horticulture, Iasi, Romania
[2] "Virgil Madgearu" Technologic and Economic College

met, restrictive from one year to the other (Dogaru *et al*., 2006; Marin and Burada, 2007). At the same time, legume seeds lose their germination capacity quickly under the action of external factors, which cause changes in the ratio between carbohydrates, proteins, lipids, water and mineral salts (Butnariu and Butu, 2014).

Seed viability is a matter of great concern and measures to maintain germination efficiency of stored seeds have significant economical implications. A range of pre-harvest, harvest and post-harvest conditions affect seed viability (Basu, 1995; Muntean *et al*., 2003). On the other hand, seed ageing which is linked to loss of seed viability with time is inevitable and the best that can be done is to lower its rate (Coolbear, 1995). Many factors contribute to seed ageing. These include genetics, mechanical damage, relative humidity and temperature of the storage environment, seed water content, presence of microflora, seed maturity, etc. The rate of loss of seed viability is mainly a function of temperature and seed moisture content. During ageing, seed viability and vigour decrease. Furthermore, the losses of viability and vigour in seeds differ with species and cultivars (Muresan *et al*., 1986; Demirkaya *et al*., 2010).

Seed germination is a succession of biological phenomena that take place at the cellular level and ultimately determine the transformation of the embryo into germs, based on chemical and physical changes (Munteanu, 2010).

There are many situations in which, under normal environmental conditions and at the same percentage of germination, the vigor of growth of young seedlings differs greatly.

The purpose of this paper was to highlight the germination capacity of three garden pea crops kept under normal storage conditions for two years.

MATERIALS AND METHOD

The determination of germination takes into account at least two working standards, that for the taking of laboratory samples and for the determination of germination, completed in order to establish the vigor and viability of the seeds.

From the well-homogenized pure seed mass, there are 150 seeds at random - 3 repetitions of 50 seeds each, placed far enough away to ensure enough space for growth and nutrition of germs but also to protect seeds uncontaminated by disease. If the seeds are heavily infected, it is necessary to change the paper layer to an intermediate count.

Germination between layers of paper-BP was used as a germination method (fig. 1).

The seeds were germinated between rolls of paper rolled and evenly distributed in an Sanyo MLR germinator. For the garden pea, the temperature parameters were set at 15 oC and the relative humidity at 75%, it being known that the pea seeds are not pretentious at low temperature. Also, until the beginning of germination for 24 hours the light was completely absent, and after the beginning of germination the light was adjusted to 8000 lux during the day (16 hours) and dark at night (8 hours).

Fig. 1 - Organizing experiments using paper (BP)

The distribution of seeds on paper is done manually because the pea seeds are large, so as to allow the proper development of germs. The mounted seed repellents are rolled and placed in plastic bags to keep the humidity constant, placed in the germinator, in a horizontal position.

Considering the fact that the germination analysis is applicable to a large number of species, in order to standardize the working methods, SR 1634/1999 establishes the requirements of each species with respect to environmental factors, which must be observed in any officially accredited or authorized laboratory.

The seeds from the three different cultivations and years were analyzed in dynamics, in 2020, for 2 or 3 years of storage.

After determining the physical purity, which was between 99.6 and 99.9%, the seeds were prepared in order to determine germination, for seeds obtained from 2017-2018.

According to the 1999 SR 1634 standard, the minimum germination for pea seeds must be 80%.

RESULTS AND DISCUSSIONS

The germ considered normal has the following normal essential structures: the root system is intact; the main root is intact or with slight defects, discolored or with necrotic spots scars from cracks and fissures, splits and superficial cracks.

Germs that have a defective main root are classified as normal if they have enough well-developed secondary roots.

The germination dynamics for the three cultivars of garden pea seeds is presented in table 1. Data are presented for each cultivar and storage year for normally developed germs.

It is worth mentioning that no germinated hard or fresh seeds were found after germination.

Only 5 days after the establishment of the experiment, only the seeds from 2018 germinated, 5% Meraviglia, 15% Gloriosa and 26.7% at Kelvedon Wonder.

Table 1

Dynamics of pea seed germination (%)

Treatment	5-th DAS*	6-th DAS	7-th DAS	8-th DAS	9-th DAS	10-th DAS	11-th DAS
Gloriosa 2017	0.0	23.3	40.0	61.7	62.3	65.0	68.3
Gloriosa 2018	15.0	36.7	63.3	76.7	84.0	90.7	93.3
Meraviglia 2017	0.0	10.0	35.0	47.3	50.7	60.7	61.7
Meraviglia 2018	5.0	48.3	80.0	93.3	95.0	95.0	95.7
Kelvedon Wonder 2017	0.0	10.0	30.0	56.7	71.7	72.7	77.3
Kelvedon Wonder 2018	26.7	80.0	95.0	100.0	100.0	100.0	100.0

DAS – days after seeding

On the 6th day after sowing (DAS), the seeds in 2017 formed a percentage of germs that varied between 10% in Meraviglia and Kelvedon Wonder and 23.3% in Gloriosa. The highest percentage of seeds germinated on the 6th day of DAS was analyzed at Kelvedon wonder with a germination rate of 80% (fig. 2).

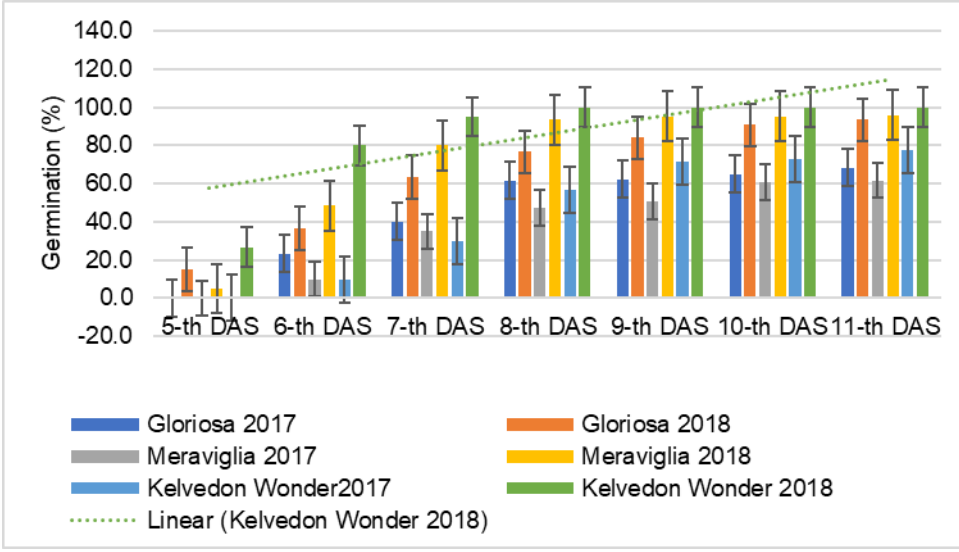

Fig. 2 - Graphical reprezentation of pea seed germination (%)

The germination energy determined in the middle of the germination period of the seeds showed that the highest percentage was found at Kelvedon Wonder, when the seeds germinated 100%.

The smallest difference between the years of seed production is found in Gloriosa, 61.7% for seeds produced in 2017 and 76.7% for seeds from 2018.

The largest difference in germination energy is found in the Meraviglia cultivar of 46% and in Kelvedon Wonder 43%.

The data in figure 2 show that the seeds from 2018, for all three cultivars meet the minimum germination conditions in order to be used, respectively the germination must be over 80%.

The seeds from 2017 quickly lose their germination after 3 years of storage, the germination loss varying between 22.7% in Kelvedon wonder and 38.8% in Meraviglia.

Of the three cultivars, Meraviglia loses its germination the fastest, with a loss of 34% in the cultivar.

At the end of the germination period, respectively on the 7th day of germination determination, the total germination varied between 61.7% at Meraviglia 2017 and 100% at Kelvedon wonder 2018 (fig. 3). With the exception of the Kelvedon wonder cultivar, where seed germination after three years of storage is close to 80%, the other two varieties lose their germination faster, which makes them unsuitable for use in the establishment of crops.

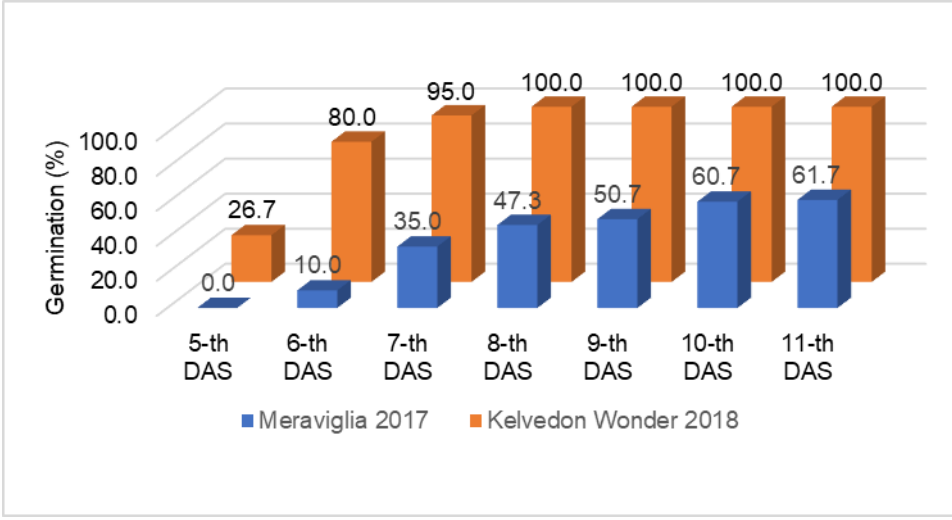

Fig. 3 - Germination seeds for Meraviglia 2017 and Kelvedon Wonder 2018 (%)

The study also highlights the need to study crop technologies that could maintain the germination capacity of pea seeds for more than two years for the purpose of annual seed reproduction.

CONCLUSIONS

The obtained results highlight a direct correlation that exists between the pea cultivar and germination percentage of the seeds, which indicates that the storage process directly influences this process.

Pea seeds stored for more than two years become unsuitable for use in the establishment of crops, acceptable limit for germination, respectively 80%.

The highest loss of total germination was recorded at Meraviglia, respectively 38.3%.

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