Int. Agrophysics, 1999, 13, 431-433

DETERMINATION OF GERMINATION CAPABILITY OF COATED SEEDS

M. Domoradzki

Department of Technology and Apparati for Chemical and Food Industry, Technical - Agricultural University, Seminaryjna 3, 85-326 Bydgoszcz, Poland

Accepted July 9, 1999

A b s t r a c t. In the present work problems associated with germination of coated seeds in the absorbent paper are described. Determination methods for the estimations of coated seed germination capability which allow to obtain very accurate results were proposed and tested.

K e y w o r d s: seed-coating, seed-pelleting, application-methods

INTRODUCTION

Attested seeds are subjected to the germination tests in the Seed Testing Stations. Evaluation of seed germination capability on the surface of absorbent paper often does not give repeatable results. These problems were very clearly seen during quality evaluation of the sugar beet coated seeds. A method of evaluation of their germination capability in special air-tight boxes to protect the seeds against drying, was developed. To provide proper access of water to the seeds, they were placed in the grooves of the accordion-pleated absorbent paper and covered with the additional strip of the absorbent the paper. In this way uniform and constant moisture was provided.

When absorbent paper is used, it is recommended to put three stripes of the accordion -pleated absorbent paper and a cover stripe into the box [1].

The amount of water needed to obtain the maximum water capacity of the absorbent paper was calculated as follows:

- the box with the absorbent paper was flooded with water;
- after one hour excess water was removed from the box and the amount of water absorbed by the absorbent paper was calculated from the difference between the water volumes;
- the box can also be weighed before and after pouring the water and from the difference in weight the amount of absorbed water can be calculated [3].

On the basis of these measurements the maximum water capacity of the elements in the box was determined. The amount of water that should be poured into the box in order to obtain the required water capacity during germination can be calculated from the equation:

$$V = \phi V_{max} \tag{1}$$

where: φ - required water capacity (e.g., 0.7).

For unevenly cut absorbent paper or paper pieces from different lots this method did not always give repeatable results.

Therefore, it was suggested to replace filter paper with thick oil absorbent paper. Determination of the water amount absorbed by the element that consisted of one accordion-pleated oil absorbent paper and a cover made of filter paper according to the recommended method did not give repeatable results. It resulted from

the different weight of the absorbent paper elements caused by their uneven cutting.

Therefore, a method that allowed for precise calculation of the water amount added to the box basing on the accurate mass of the absorbent paper element was tested. Calculations were made on the basis of the earlier measurements of the maximum water capacity of the absorbent paper. This method allows to determine precisely germinaton capability of the coated seeds for different water capacities of the germination base.

MATERIALS AND RESULTS

The developed method is based on the precise determination of the maximum water capacity of the absorbent paper used and precise weighing. The amount of water, which should be added to the box with the absorbent paper element is calculated from the equation:

$$V = \varphi\left(A_1 m_1 + A_2 m_2\right) \qquad (2)$$

where V - mass or water volume (g or ml water), φ - required water capacity, A_1 - maximum capa- city of thick absorbent paper (g water/g dry absorbent paper), A_2 - maximum capacity of thin absorbent paper (g water /g dry absorbent paper), m_1 - mass of thick absorbent paper (g), m_2 - mass of thin absorbent paper (g).

Maximum water capacity of the absorbent paper elements was determined on the basis of ten measurements. The measurements were taken for the weighed strips of the absorbent paper, later immersed in water for 1 h, then left to drain for 15 min and weighed again. The maximum water capacity was:

$$A_1 = 2.41 \text{ g/g} \quad A_2 = 2.39 \text{ g/g}$$

$$\text{average weight } A = 2.40 \text{ g/g}$$

In this case the Eq. (2) is reduced to:

$$V = \varphi A\left(m_1 + m_2\right). \qquad (3)$$

In practice the amount of water calculated in the way described above is added to the boxes from a pipette on the upper surface of the

Table 1. Analysis of germination ability of coated seeds

Water capacity φ	0.5	0.6	0.7	0.8	0.9	1.0
			Berlin parsley after 28 days			
1 box	67	74	61	52	47	49
2 box	69	75	60	54	48	48
3 box	71	76	62	57	49	47
average	69	75	60	55	48	48
			Jawa carrot after 14 days			
1 box	77	71	72	80	75	71
2 box	75	70	74	80	75	70
3 box	76	69	72	78	75	69
average	76	70	74	79	75	70
			Wolska onion after 12 days			
1 box	99	96	96	98	95	93
2 box	99	95	95	96	96	93
3 box	99	97	97	97	97	93
average	99	96	96	97	96	93
			Polan cucumber after 8 days			
1 box	98	97	100	95	96	98
2 box	99	98	100	94	95	97
3 box	97	99	100	96	94	96
average	98	98	100	95	95	97

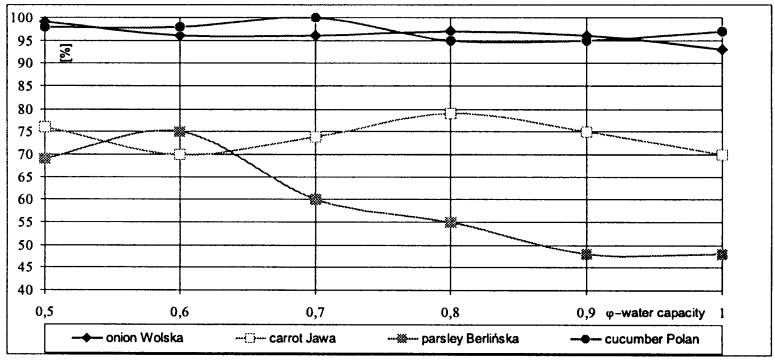

Fig. 1. Relation between germination capability of seeds at different moisture levels.

absorbent paper cover. Next, the box, is closed tightly and left for 8-12 h in order to moisturise absorbent paper uniformly. It is convenient to note the analysis number and the calculated water amount which should be added to the box on the absorbent paper cover.

CONCLUSIONS

In this work the analysis of germination abilities of coated seeds was made. Examples of the results on the determined germination capability are shown in Table 1 and in Fig. 1.

Analysis of the test results of coated seed germination capability carried out for various moisture levels shows that repeatability is satisfactory and that small scatter of the results may be caused by statistical errors in taking an average sample for analysis. Figure 1 shows the relation between seed germination capability at a certain moisture level (the water capacity of the base). It clearly shows a decrease in the seed germination capability after an increase of the water capacity of the absorbent paper. This result agrees with the results reported by several other authors [2,4-7].

It seems that the suggested method can be used successfully for the determination of germination capability of coated seeds. This method allows to determine precisely germination capability of the seeds in various moisture conditions of the base, which can be very important in practice.

REFERENCES

1. **Belotti J.**: Methodical indications for evaluation of coated seeds. BiHiAR, 5-6, 1973.
2. **Hibbert D., Thomson D.C., Woddwark G.:** Observations on the effects of different pelleting processes on the laboratory germination and field emergence of sugar beed seed. Institut International de Recherches Betteravieres, Compte Rendu, 7(1), 24-32, 1975.
3. Polish Standard: PN-94/R-65950, 1994.
4. **Roos E.E, Moore F.D.:** Effect of seed coating on performance of lettuce seeds in greenhouse soil tests. J. Am. Soc. for Hort. Sci., 100(5), 573-576, 1975.
5. **Sooter C.A, Millier W.F.:** The effect of pellet coatings on the seedling emergence from lettuce seeds. Trans. ASAE, 21(6), 1034-1039, 1978.
6. **Veverka K.:** Effect of pelleting on water uptake and the germination of sugar beet seed. Acta Agronomica Scientiarum Hungaricae, 32(1/2), 173-179, 1983.
7. **Weiser F.:** Eine rationelle Serienmethode zur Feststellumg der Keimfähigkeit von Samen und Peillensamen. Die Bondenkultur, 24(1), 51-55, 1973.