

THE STUDY OF SEED TESTING PARAMETERS OF WINTER WHEAT AND TRITICALE VARIETIES

PÉTER JAKAB¹, ISTVÁN, MIHÁLY PETRÓCZI², TÍMEA HORVÁTH¹,
ISTVÁN KRISTÓ³

¹University of Szeged, Faculty of Agriculture

²Cereal Research Nonprofit Ltd, Szeged

³Hungarian Chamber of Agriculture, Food and Rural Development, Csongrad County,
Szeged

e-mail: jakabpeter@mgk.u-szeged.hu

Abstract: We examined the effect of nutrient supply and grain size on some laboratory research parameters of wheat and triticale seeds (thousand seed weight, percentage of germination, germination vigour) and on the basis of the results to provide useful information for practice. The thousand seed weight was significantly affected by the size of the grain, but the nutrient treatments also had an effect on it. The nutrient supply in most cases did not significantly change the percentage of germination in the average of the tested varieties. Along with the growing grain size the percentage of germination was also improving in both species. The percentage of germination difference between the highest and lowest seed size in both species was statistically justified. Germination vigour had also the best result in the maximum grain size. Considering the study results, the grains larger than 2.2 mm-s can be recommended for market.

Key words: winter wheat, triticale, nutrient supply, thousand seed weight, percentage of germination.

INTRODUCTION

In Hungary the sown area of winter wheat is 1-1.2 million hectares and the crop area of triticale is between 110-150 thousand hectares. The yields are 3-5 million tons a year in winter wheat and 300-600 thousand tons in triticale. The quantity and quality of winter wheat and triticale depend on exterior factors (agro-technical, ecological) and seed quality parameters. The suitable choice of species substantially influences the efficiency of production. The purpose of the farmer is to sow the best quality seed, which provides big quantity and high-quality grain, therefore it is important for the farmer to sow the suitable quality, checked and processed seed. The success of seed production is determined by the complex effect of ecological, biological, and agro-technical factors. Among the agro-technical factors the nutrient supply had a determinative effect on the quantity and quality of yield.

To provide the required amount of supplementary nutrients, it is necessary to determine the suitable NPK nutrient rate for the plants. Nitrogen can be absorbed only in the presence of the necessary phosphorus and potassium supplies, and a large dose of nitrogen alone induces crop depression [6]. The germination vigour of big and medium fraction was better than the small fraction and the unscreened seed [2]. The suitable nitrogen supply is necessary for the good germination ability of cereals [4] [5]. The satisfactory nitrogen supply provides big thousand seed weight [3].

For winter wheat in the interest of the good germination ability we must provide the suitable nitrogen supply in graining phase, however he says, that the overdone nitrogen dosage causes germination inhibition [4]. The quantity of spring chemical fertilizer- depending on the genotype of winter wheat- had good effect on the vigour of winter wheat [8]. The unilateral N-fertilization causes phosphorus deficiency and decreased the yield, and size of wheat grain. The optimal phosphorus supply reduces the proportion of small grains, and increases the proportion of higher grains [1].

MATERIAL AND METHODS

Soil properties of the experimental field

The experiment was set on the area of the Cereal Research Non-Profit Ltd in Fülöpszállás. The soil was meadow soil. Before setting the experiment the soil analysis data showed that it had good nitrogen, phosphorus and potassium content. (Table 1).

Table 1.

Main properties of the experimental field area

pH (KCl)	Soil plasticity value K _A	Humus (%)	P ₂ O ₅ (mg/kg)	K ₂ O (mg/kg)
7.57	48	3.03	172	384

Source: Cereal Research Non-Profit Ltd

We examined three winter wheat (GK Csillag, GK Békés, GK Petur), and two triticale varieties (GK Szemes, GK Idus) seed testing parameters. Wheat seeds grown in seven different nutrient treatments and triticale grown in 10 nutrient treatments were divided into three groups. The first group contains seeds smaller than 2.2 mm-s, the second group is for grains between 2.2-2.8 mm-s, and the third one is for grains bigger than 2.8 mm-s.

Laboratory experiments. The seed testing parameters studies have done in laboratory of Institute of Plant Sciences and Environmental Protection University of Szeged Faculty of Agriculture. We germinated 50 seeds in every nutrient treatment, in four replications. We made the germination tests on wet filter paper in rolls. The temperature was 20-22 °C, and the humidity was 80-90%. The humidity of the filter paper rolls was checked daily, and if necessary, was sprayed with water to avoid dehydration. The filter paper rolls we opened after three, five, and after seven days the normal germs were selected and counted. We processed the obtained data by single factor variant analysis [7].

RESEARCH RESULTS

The effect of particle size on the percentage of germination

Figure 1. illustrates the effect of grain size of winter wheat varieties on the percentage of germination. The percentage of germination of seeds which was less than 2.2 mm-s was 95.98%. The percentage of germination of the other two bigger fractions were significantly higher (97.88%, 98.76%, LSD 5% 0.72). Based on the results of the study we concluded that the smallest grain size is less suitable seed.

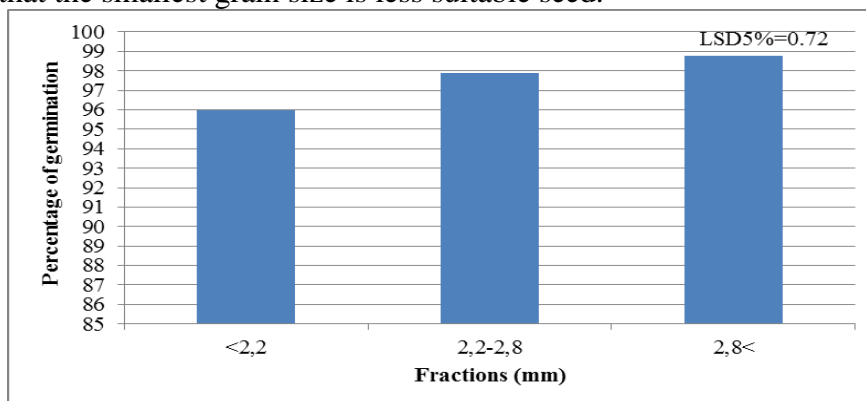


Figure 1. The effect of grain size of winter wheat varieties on the percentage of germination

Source: own results

Figure 2 shows the effect of triticale grain size on the percentage of germination. In this study also, the smallest seeds percentage of germination was the least (94.38%). The increasing of seeds size, the percentage of germination was improved. The percentage of

germination of the largest seeds was 97.4%. The difference between the smallest and the largest fractions was significant ($LSD_{5\%}=0.72$). Based on the results of the two studies, in both cases the largest seeds had the best germination results. Also it could be concluded that, for the two species, the percentage of germination of the wheat is better than that of the triticale.

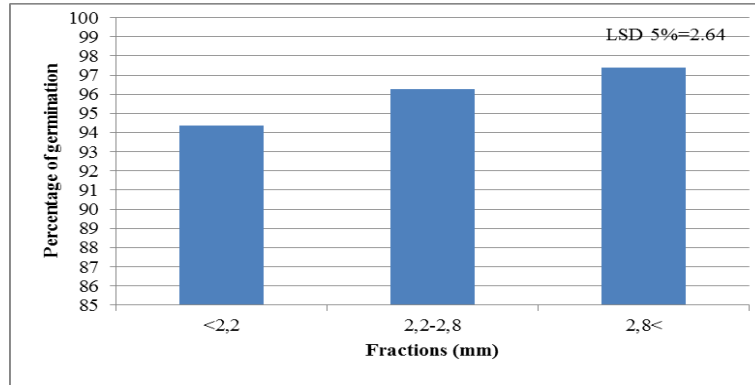


Figure 2. The effect of particle size of triticale varieties on the percentage of germination

Source: own results

Study of germination vigour

We counted the number of intact and healthy winter wheat seedlings in the paper rolls on the third, fifth and seventh day of germination. The highest value (90.14%) was shown by the seeds larger than 2.8 mm-s on the third germination day. The germination vigour decreased in accordance with the decreasing seed size. Compared to the germination vigour results of third day, the results of fifth and seventh days were significantly lower. On the fifth and the seventh days, the smallest fraction of winter wheat had the best germination vigour (Figure 3).

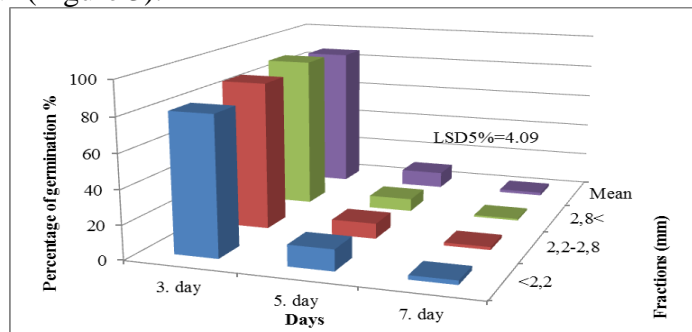


Figure 3. The germination vigour of winter wheat

Source: own results

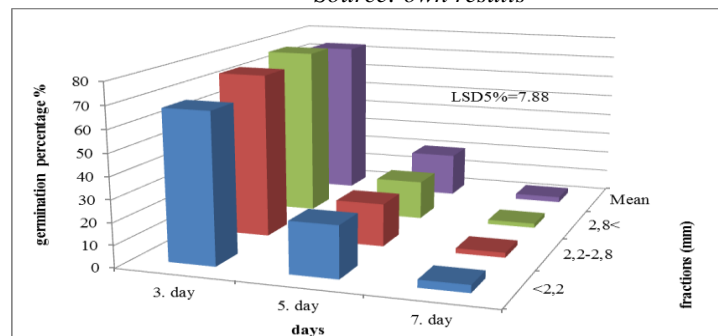


Figure 4. The germination vigour of triticale

Source: own results

On the third day the germination vigour of seeds smaller than 2.2 mm was the least, 67.5%. The larger grains germination vigor improved. The germination vigour of the largest grains was best, 77.5%.

On the third day as compared to the results of the results of the fifth and the seventh day was significantly lower. Based on the two studies, the germination vigour in winter wheat was higher than in triticale.

CONCLUSIONS

Many factors determined the percentage of germination and germination vigour of seeds (ecological, agro-technical and biological). We examined the effect of grain size on some laboratory research parameters of wheat and triticale seeds.

Along with the growing grain size the percentage of germination was also improving in both species. The percentage of germination difference between the highest and lowest seed size in both species was statistically justified. Germination vigour had also the best result in the maximum grain size. Based on the experimental results, the grains larger than 2.2 mm-s can be recommended for market. We concluded, that winter wheat had better percentage of germination and germination vigour than the triticale.

REFERENCES

1. **ÁRENDÁS, T., SARKADI, J., BÓNIS, P.,** 2000, Műtrágyák hatása az őszi búza méret szerinti frakcionált mennyiségére és néhány minőségi jellemzőjére. *Növénytermelés.* 49. 519-525. p.
2. **DRENA, G.,** 2004, Influence of seed size of some cereals on germination energy, total germinability and emergence. *Radovi Poljoprivrednog Fakulteta Univerziteta u Sarajevu Works of the Faculty of Agriculture Universty of Sarajevo.* 49. 5-14 p.
3. **KRUPPA, J.,** 2004, Triticále. 229-240 p. In.: Izsáki Z.-Lázár L. (szerk.): Szántóföldi növények vetőmagtermesztése és kereskedelme. *Mezőgazda Kiadó, Budapest,* 665 p.
4. **LIERES, AL., VON,** 1996, The effect of organic and mineral N fertilizers on the germinability of winter wheat and rye. In: *Einfluss der organischen und mineralischen N-Düngung auf die Keimfähigkeit von Winterweizen und Winterroggen.* 16-21. 9. 1996. 123-126.p.
5. **PETHŐ, M.,** 2004, *Mezőgazdasági növények élettana.* Akadémia Kiadó, Budapest, 507 p.
6. **SÁRVÁRI, M.,** 2006, A vetésforgó és a tápanyagellátás szerepe az őszi búza termesztésében. In: *Búzavertikum aktuális kérdései. Szaktanácsadási füzetek 2.* Debrecen. 64-72.p.
7. **SVÁB, J.,** 1981, *Biometriai módszerek a kutatásban.* Mezőgazdasági Kiadó. Budapest. 557.p.
8. **SZANYI, M., GÖNCZ, A.,** 1991, A vetésidő és a N műtrágyázás hatása az őszi búza vetőmag biológiai értékére (vigorára). *Növénytermelés.* 40. 333-338. p.