

ASSESSMENT OF BIOMETRIC CHARACTERISTICS OF PLANTS AND YIELD OF SELECTED WINTER VARIETIES OF GARLIC

Ewa Rekowska

Department of Horticulture, West Pomeranian University of Technology in Szczecin (Poland)

Abstract

Garlic producers in Poland mostly grow local ecotypes, unbalanced in morphological and functional characteristics, which influences the fluctuation of the yield in subsequent years (Nużyńska-Wierdak 1998). Therefore, there is a need of a broader introduction to cultivation of farm varieties, characterised by a high and good quality yield and good storage properties.

The purpose of conducted studies was the comparison of the growth dynamics and plant development of four Polish garlic varieties (Arkus., Harnaś, Huzar and Orlik) designated for winter cultivation. Significant diversity of assessed parameters in studied varieties was proved. Harnaś variety stood out from the assessed garlic varieties. The highest percentage of germinations was noticed in case of cultivation of this variety, the plants reached the biggest height and had the longest leaves; the harvested crop of bulbs was significantly bigger in comparison to the other varieties.

Key words: winter variety garlic, selected phytometric parameters, yield.

1. INTRODUCTION

Garlic, due to its high nutritional value and specific taste is a valued vegetable grown all over the world (Majkowska-Gadomska & Wierzbicka 2006). One of the most important factors deciding about the effects of production of this vegetable is a selection of appropriate variety depending on the time of cultivation and the crop purpose. It is assumed that the genetic factor decides in 15-20% about the crop yield, but also the quality of the crop is important (Astley et al. 1982). According to Doruchowski (2006), the time of planting, the manner of use and the market requirements should be taken into consideration while choosing the variety. Varieties useful both for autumn and spring planting are available on the Polish market (Nużyńska-Wierdak 1997).

It is estimated that about 10-20 thousand tons of this vegetable is produced in Poland, which covers about 30% of the national demand (Włoszczyk 2014).

The purpose of conducted studies was the comparison of the dynamics of growth and development of selected varieties of garlic from Polish plantation and designated for winter cultivation.

2. MATERIAL AND METHODS

One-factor field experiments were conducted in the years 2009-2010 at the Department of Horticulture in Szczecin. The progress of growth of plants of four garlic varieties was assessed (Krakow Plantation and Seed Growing POLAN Ltd.): Arkus, Harnaś, Huzar, and Orlik in cultivation for the harvest with dried bulbs. An area of a single plot for the crop was 1.08 m² (1.2 x 0.9m). Garlic was cultivated in the second year after manure (dosage 30 t·ha⁻¹). Mineral fertilising was additionally used, the dose of which was dependent on a current contents of nutrients in the soil. The total of phosphoric and potassic fertilisers, and one-third of nitric fertilisers, were used before planting the garlic, while the remaining two-thirds was applied in the top dressing (the former after the plants' germination and the latter three weeks later). Cloves of garlic, before planting, were wet treated with Sumilex preparation (concentration 0.3%), then they were planted on 20th October (in both years) in spacing of 30 x 10cm.

Aeration of the soil and manual weeding was systematically performed in the vegetation period; the plants were watered in drought.

The assessment of the plants germination in relation to the number of planted cloves of garlic was carried out in the spring. The measurements of more important biometric characteristics were conducted in the period of the plants growth every 7 days: height of plants, number of leaves, length and width of a leaf blade. The measurements were carried out on 20 plants in each place in two repetitions. The garlic harvest was performed

on 14th July (in 2009) and on 17th July (in 2010). The number of harvested bulbs was assessed and the obtained results were statistically processed with Tuckey's test for the significance level of $\alpha=0.05$.

3. RESULTS AND DISCUSSION

On average, for two years of the study, the highest percentage of germinations in relation to the number of planted cloves was found in Harnaś variety (86.7%). Worse germinations were indicated in Orlik variety (on average 79.2%). The smallest percentage of plants were obtained from planting cloves in relation to Arkus and Huzar varieties (70.4 and 70.8% respectively). In this case they were lower on average by 16.1% compared with germinations in Harnaś variety. Taking into consideration the years of the study, better germinations were observed in the first year of the experiment (2009).

Figures 2-5 present data showing the course of growth of assessed garlic varieties in the period from 30th April to 11th September.

The data in figure 2 indicate that Harnaś variety garlic reached the biggest height for the whole period of making phytometric measurements. The smallest, on the other hand, were plants of Orlik variety. During the last measurement made before the harvest (11.06) – the difference in height between plants of those two varieties was 22.6 cm.

In relation to the number of leaves (Fig. 3), the biggest differences between the examined varieties were noticed at the beginning of the vegetation period (30.04) – on average from 5.0 leaves (in Arkus variety) to 3.1 ones (in Orlik variety). In later periods the differences in the number of leaves in the assessed varieties were not so significant.

As the data in Fig. 4 indicate, no significant differences were noticed in the length of leaves in Harnaś and Huzar varieties at the beginning of the vegetation period (measurements made on 30.04 and 7.05). In case of those varieties the chive was longer on average by 10 cm (in the measurement made on 30.04) compared to Orlik variety garlic where the plants had the shortest leaves throughout the whole period of growth.

The most intensive increase in the leaf blade for the width was noted in all studied garlic varieties in the period from 14.05 to 21.05 (Fig. 5). The leaves of Orlik variety were the narrowest in the whole period of the measurements. No significant differences of the studied characteristic between the remaining varieties were proved.

Sylani (2010) & Król et al. (2013) conducted similar studies concerning the analysis of biometric characteristics of selected garden plants. The former indicated significant diversity of selected vegetative features (assimilation area of leaves, number of flowers in a raceme) in two varieties of strawberry (Elsanta and Sonata) grown in a low film tunnel. It had a significant influence on the size of obtained fruit crop. Król et al., on the other hand, compared biometric features (number of sprouts, number of leaves, height of plant) in 12 varieties of raspberries and 5 varieties of blackberries. The purpose of the study was to determine the efficiency of vegetative parts of plants for pharmaceutical purposes. Significant differences in vegetative efficiency of parts of plants depending on grown varieties were shown.

On the other hand, Adamczewska-Sowińska & Kołota (1998) & Felczyński (2010) analysed the reaction to winter hardiness of the leak wintering on a field and the onion cultivated from spring onion, which characteristic significantly influences plants germination and at the same time the obtained yield. The authors showed significant differences concerning winter hardiness, harvest earliness, premature bolting, and the yield among the assessed varieties.

Fig. 6 present the data concerning the number of harvested commercial bulbs of garlic depending on the studied varieties. In this case Harnaś variety turned out to be the most prolific. No significant diversity in crop (in thousands of pieces from 1 ha) among Arkus, Huzar and Orlik varieties were found.

Also Koudela & Petřikova (2000), Adamczewska-Sowińska & Uklńska (2009), Danek & Orzeł (2009), Wojciechowska et al. (2009), or Cholakov & Angelova (2010) paid attention in their studies to the variety factor, significant from the point of view of the quantity and quality of the crop and chemical composition of the vegetables. Similar studies in this respect were conducted by Rusinova et al. (2010). The authors assessed the quantity and quality of the crop of 8 varieties of potato. It was established that the difference in the crop size between the best yielding variety and the least prolific one was 31.1%.

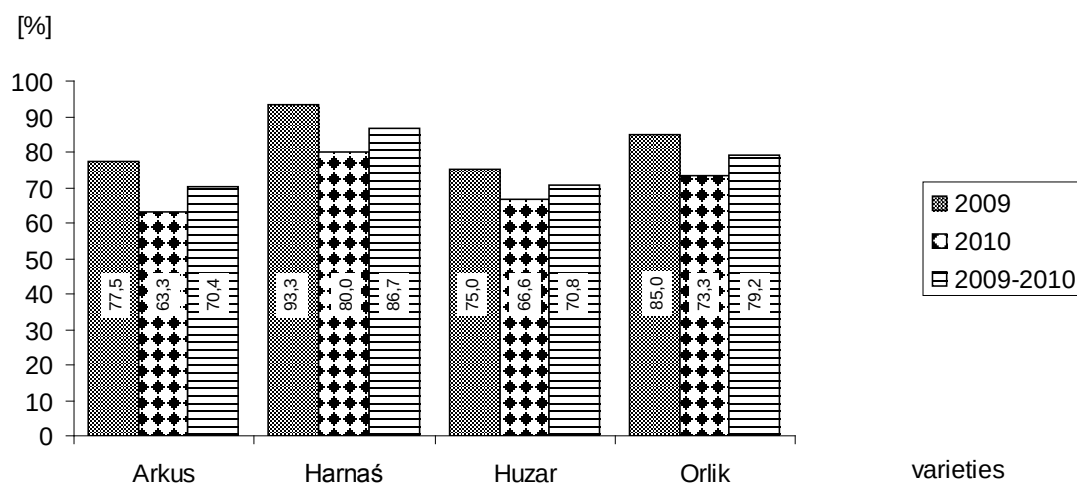
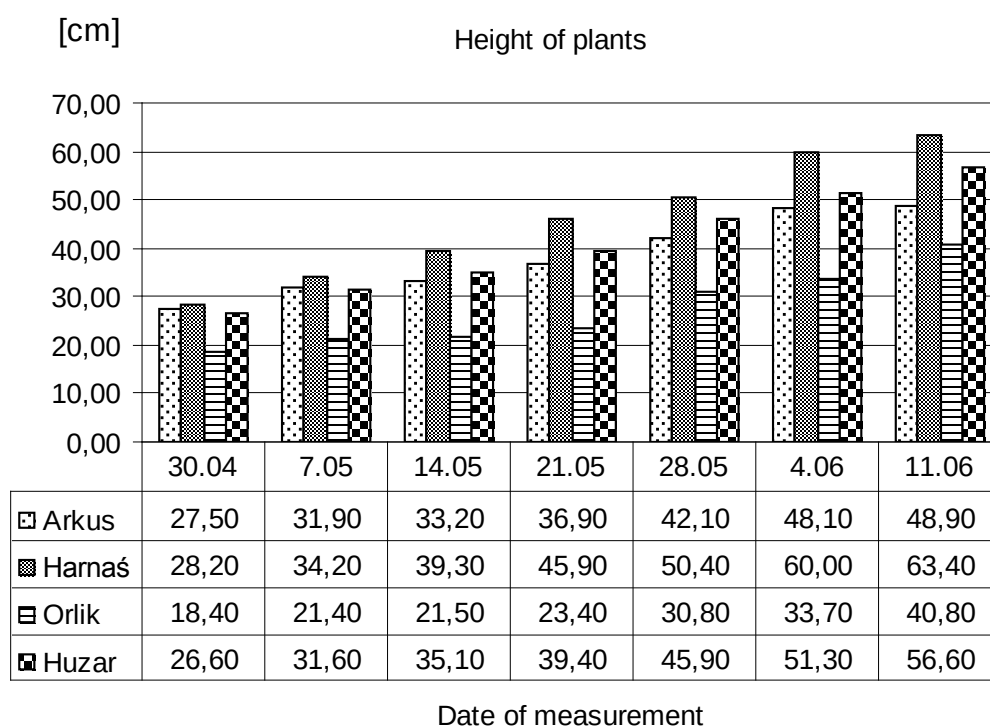


Fig. 1. Assessment of germinations of selected varieties of garlic cultivated for dried bulb

Fig. 2. Dynamics of growth of plants of four varieties of garlic in cultivation for dried bulb
(mean of years 2009-2010)

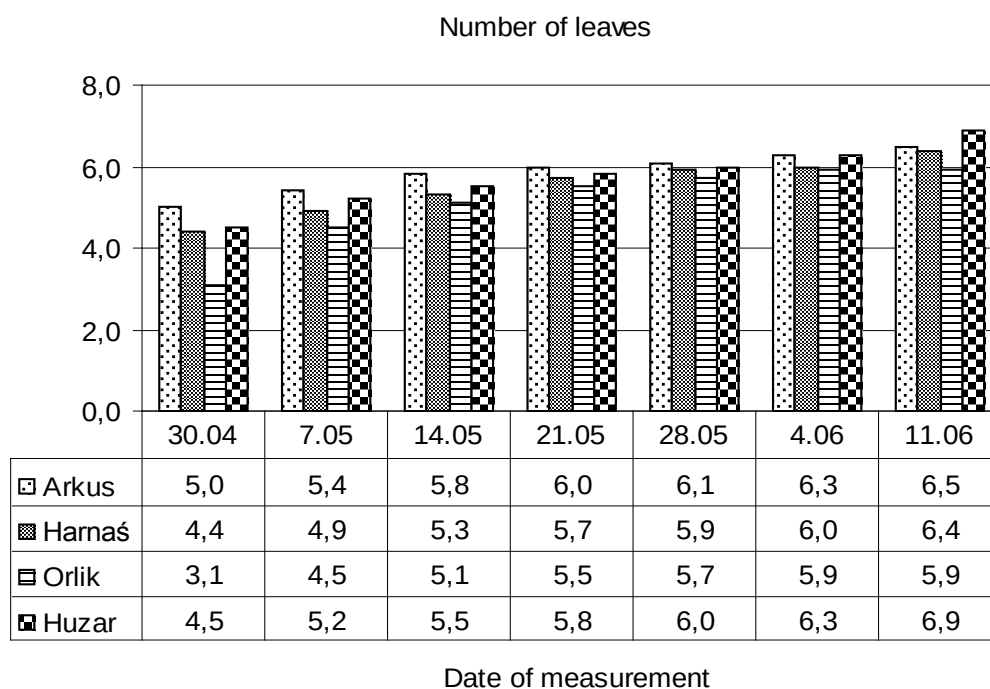


Fig. 3. Increase in number of leaves of four garlic varieties in cultivation for dried bulb
(mean of years 2009-2010)

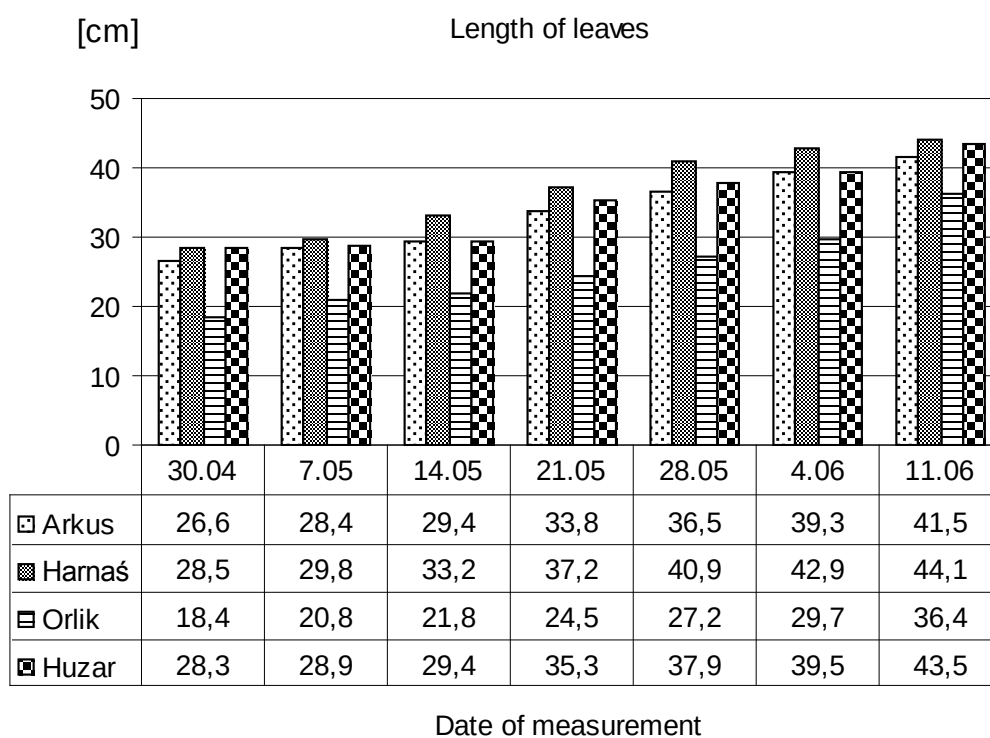


Fig. 4. Growth of leaf blade in length of four garlic varieties in cultivation for dried bulb
(mean of years 2009-2010)

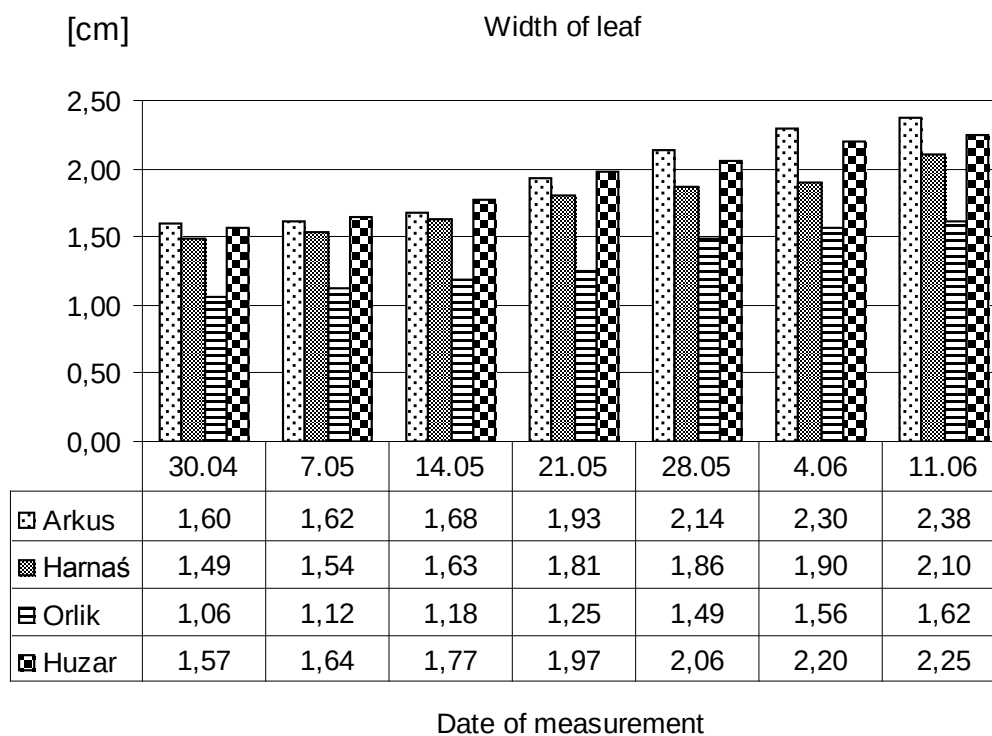


Fig. 5. Growth of leaf blade in width of four garlic varieties in cultivation for dried bulb (mean of years 2009-2010)

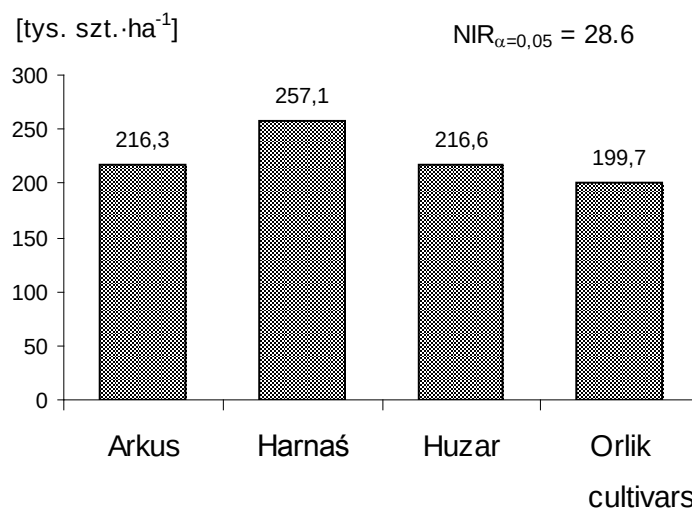


Fig. 6. Yield of four winter garlic varieties (thousands of pieces · ha⁻¹)

4. CONCLUSIONS

1. Significant diversity of the studied garlic varieties in the percentage of germinations, studied phytometric features and the number of obtained bulbs were proven.
2. Harnaś variety stood out from the assessed winter garlic varieties. The highest percentage of germinations was noted in case of cultivation of this variety, the plants reached the biggest height and had the longest leaves. Significantly most numerous number of commercial bulbs, in comparison to the other varieties, was also harvested.

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