

Yield of Wheat (*Triticum aestivum*, L) Dewata 162 Variety at Various Planting Distances and ZnSO₄ Fertilizer Doses

Aulia Fadillah^{1*}, Siti Nurul Iftitah¹, Agus Suprpto¹

¹Department of Agriculture, Faculty of Agriculture, Universitas Tidar
Jl. Kapten Suparman No 39, Magelang Utara, Magelang, Jawa Tengah, Indonesia

*Correspondence : auliafadil10@gmail.com, +62-88238772940

ABSTRACT

Research on the yield of wheat (*Triticum aestivum*, L.) Dewata 162 variety at various planting distances and doses of ZnSO₄ fertilizer was carried out from November 23, 2021 to February 24, 2022. The research was conducted in Wirosari village, Patean District, Kendal Regency with an altitude of 530 m above sea level and the type of soil is latosol. The purpose of this study was to determine the effect of planting distances and dose of ZnSO₄ fertilizer on wheat crop yields. The study used a factorial design (4 x 3) which was arranged in a Completely Randomized Block Design (RCBF) with two factors and was repeated three times as blocks. The first factor, the planting distances is 10 cm x 10 cm, 15 cm x 10 cm, 20 cm x 10 cm, and 25 cm x 10 cm. The second factor is the dose of ZnSO₄ fertilizer consisting of doses of 0 kg/ha, 25 kg/ha and 50 kg/ha. The data were analyzed by analysis of variance and mean were separated by LSD and the Orthogonal polynomial test for the second factor. The results showed that the difference in spacing did not affect panicle length, number of seeds per panicle, number of filled seeds per panicle, dry seed weight per clump, dry seed weight per m², and 1,000 dry seed weight, but the spacing was 25 cm x 10 cm gave the highest yield on the number of tillers and the number of panicles per clump. The application of ZnSO₄ fertilizer had no effect on the number of tillers, panicle length, number of panicles per clump, number of seeds per panicle, number of filled seeds per panicle, dry seed weight per clump, dry seed weight per m², and 1000 dry seed weight. There was no interaction between plant spacing treatment and ZnSO₄ fertilizer dose on all parameters.

Keywords: dose, planting distances, varieties of Dewata 162, wheat, ZnSO₄ fertilizer.

INTRODUCTION

Wheat in Indonesia is the second staple food after rice which is used as a raw material for wheat flour because it contains gluten. Wheat consumption continues to increase in line with growing public interest in consuming processed foods made from wheat flour (1). Wheat crops generally grow well in the highlands, but the available land is very limited and has been planted with crops that have higher economic value. Planting wheat on medium plains will be a solution to the existing constraints to maximize yields (2).

The increase in wheat yields can be done by adjusting the planting distances. Planting distances is needed so that plants can take advantage of environmental factors to grow optimally. The use of appropriate planting distances on wheat

plants is needed to obtain maximum results (3). Intensive tillage and unbalanced fertilization reduce the nutrient content of the soil, especially micronutrients such as Zn (4). Zinc (Zn) is one of the essential micro nutrients for plant growth and development (5). The application of Zn fertilizer to wheat plants plays an important role in nitrogen assimilation in the process of seed filling and protein formation (6). This study was conducted to determine the effect of spacing and dose of ZnSO₄ fertilizer on wheat crop yields.

MATERIAL AND METHODS

The research was conducted on November 23, 2021 to February 24, 2022 in Wirosari Village, Patean District, Kendal Regency. The research location has an altitude of 530 m above sea level with latosol soil type. The materials used in the

study included wheat seeds of Dewata 162 variety, chicken manure, ZnSO₄, urea, SP₃₆, KCl, insecticide Decis 2.5 EC and fungicide Explore 250 EC. The tools used in the research include hoes, tugal, bamboo, gembor, sprayer, meter/ ruler, digital scales, sacks, plastic, labels, stationery and documentation tools.

The study used a factorial design (4x3) which was arranged in a Completely Randomized Block Design (RCBF) with two factors and was repeated three times as blocks. The first factor, the planting distances is 10 cm x 10 cm, 15 cm x 10 cm, 20 cm x 10 cm, and 25 cm x 10 cm. The second factor is the dose of ZnSO₄ fertilizer consisting of doses of 0 kg/ha, 25 kg/ha and 50 kg/ha. The data were analyzed by analysis of variance and mean were separated by LSD and the Orthogonal polynomial test for the second factor.

RESULT

Analysis of variance. Based on this analysis, the F-count results for all the observation parameters contained in Table 1.

Table 1. F-count observation parameters

Observation parameters	J	D	JxD
Number of tillers (stem)	3,924*	0,104 ^{ns}	1,121 ^{ns}
Panicle length (cm)	1,231 ^{ns}	0,271 ^{ns}	0,614 ^{ns}
number of panicles per clump (panicle)	3,184*	0,113 ^{ns}	1,271 ^{ns}
number of seeds per panicle (seed)	2,366 ^{ns}	0,131 ^{ns}	0,953 ^{ns}
number of filled seeds per panicle (seed)	2,115 ^{ns}	1,975 ^{ns}	1,110 ^{ns}

dry seed weight per clump (g)	0,442 ^{ns}	2,223 ^{ns}	1,109 ^{ns}
dry seed weight per m ² (g)	0,495 ^{ns}	0,528 ^{ns}	0,444 ^{ns}
1,000 dry seed weight (g)	0,149 ^{ns}	0,008 ^{ns}	1,049 ^{ns}

Description :

* : Significant

ns : Non Significant

J : Planting distances

D : ZnSO₄ fertilizer doses

JxD : Interaction of planting distances and ZnSO₄ fertilizer doses

The results of the analysis in Table 1 show that the planting distances treatment had a significant effect on the number of tillers and the number of panicles per clump, but had no effect on panicle length, number of seeds per panicle, number of filled seeds per panicle, dry seed weight per clump, dry seed weight per m², and 1,000 dry seed weight. The application of ZnSO₄ fertilizer did not affect all parameters, the number of tillers, panicle length, number of panicles per clump, number of seeds per panicle, number of filled seeds per panicle, dry seed weight per clump, dry seed weight per m², and 1,000 dry seed weight. There was no interaction between planting distances treatment and ZnSO₄ fertilizer dose on all observation parameters.

Table 2. The effect of planting distances on the number of tillers

Planting Distances	The Number of Tillers
10 cm x 10 cm	16,82 b
15 cm x 10 cm	18,42 ab
20 cm x 10 cm	19,72 a
25 cm x 10 cm	20,84 a

Description: numbers followed by the same letter are not significant at 5% LSD

Table 3. The effect of planting distances on the number of panicles per clump

Planting Distances	The Number of Panicles per Clump
10 cm x 10 cm	14,31 b
15 cm x 10 cm	15,02 ab
20 cm x 10 cm	16,89 a
25 cm x 10 cm	17,43 a

Description: numbers followed by the same letter are not significant at 5% LSD

DISCUSSION

A. The effect of planting distances on wheat yields

The use of planting distances is needed to obtain maximum results. Based on the variance in Table 1, it is known that the difference in spacing used gave the same effect on panicle length, number of seeds per panicle, number of filled seeds per panicle, dry seed weight per clump, dry seed weight per m², and 1,000 dry seed weight. This is presumably because the leaves of wheat plants do not shade each other and the amount of sunlight received by the plants is relatively the same, so there is no competition in the absorption of sunlight. The sunlight absorbed by plants will be used for photosynthesis. Sunlight is a source of energy for the photosynthesis process. The absorption of sunlight by the plant canopy is an important factor that determines photosynthesis to produce photosynthate for the formation of flowers, fruits and seeds (7).

1. The number of tillers

The planting distances treatment had a significant effect on the number of tillers whose average yield and 5% LSD can be seen in table 2. The use of planting

distances of 25 cm x 10 cm has the highest average number of tillers, which is 20.84 stems. This is presumably because the wide spacing provides good growth space for the growth of wheat plant tillers. Planting distances will cause competition for growing space because the plant leaves will shade each other, so that the absorption of sunlight by the leaves is not optimal. In accordance with the statement of Setiawan and Suparno (8), that planting distances arrangements will affect population density, efficiency of light use, and competition in the use of water and nutrients. Population density is related to the spacing used. The use of planting distances of 25 cm x 10 cm is no different from planting distances of 20 cm x 10 cm and 15 cm x 10 cm because the existing growing space can still be utilized by plants to the fullest, but it is different from the planting distances of 10 cm x 10 cm. This is because the growing space that will be used for saplings is small.

2. The number of panicles per clump

The results of the 5% LSD in table 3 showed that at planting distances of 25 cm x 10 cm the average number of panicles per clump was 17.43, but it was not different from the spacing of 20 cm x 10 cm and 15 cm x 10 cm. The number of panicles produced by wheat plants is influenced by the availability of nutrients to meet the needs of the plant and the number of tillers. The large number of tillers produced, the more panicles there will be. The results of Vatjarjianto's research (9), it was found that the number of tillers had a positive correlation with the number of productive tillers or panicles. The more tillers there are,

the more productive tillers or panicles are produced.

The use of planting distances of 10 cm x 10 cm gave the lowest number of panicles per clump, namely 14.31 panicles, because the large number of populations in the plots resulted in competition between plants in utilizing nutrients and growing space. This is in accordance with the research of Magfiroh et al. (10), that more plant populations will result in competition between plants in obtaining nutrients, sunlight for photosynthesis and space to grow so that it can affect panicle growth.

B. The effect of ZnSO₄ fertilizer doses on wheat yields

Fertilization is an important part in efforts to increase wheat yields. The results of analysis showed that the application of ZnSO₄ fertilizer did not affect the number of tillers, panicle length, number of panicles per clump, number of seeds per panicle, number of filled seeds per panicle, dry seed weight per clump, dry seed weight per m², and 1,000 dry seed weight. It is suspected that the method of applying ZnSO₄ fertilizer is not appropriate, so that the absorption of nutrients is less effective. Fertilization method through soil is not suitable to be done because the possibility of loss of nutrients that have been given is large due to leaching. The nature of ZnSO₄ fertilizer which is easily soluble by water also has an influence on the availability of Zn elements.

C. The effect of interaction between planting distances and ZnSO₄ fertilizer dose on wheat yields

The results of the analysis in Table 1 show that there was no interaction between the spacing treatment and ZnSO₄ fertilizer

dose on all parameters, namely the number of tillers, panicle length, number of panicles per clump, number of seeds per panicle, number of filled seeds per panicle, dry seed weight per clump, dry seed weight per m², and 1,000 dry seed weight. It is suspected that the need for Zn and growing space for plant growth and development has been fulfilled, so that there is no competition between plants. The element Zn serves to help the process of plant photosynthesis. In accordance with the results of research Rahmawati et al. (11), that the availability of nutrients will affect the vegetative growth of plants such as the growth of roots, stems and leaves. Optimal vegetative growth will affect the process of plant photosynthesis. The more results from photosynthesis that occur will cause the number of seeds to be produced more.

ZnSO₄ fertilization had no effect on plants because it was dissolved by rainwater, due to high rainfall during cultivation. The results of Nasution's research (12), a lot of rainfall will affect wheat yields because there is a decrease in the number of grain contents per panicle due to excess water in the generative or flowering phase. Low rainfall results in limited water availability, while higher rainfall will inhibit seed formation due to disruption of the pollination process in flowers.

CONCLUSION

Based on the results of the research conducted, it can be concluded that the planting distances of 25 cm x 10 cm resulted in the highest number of tillers and number of panicles per clump. The application of ZnSO₄ fertilizer had no effect on all observation parameters and there was

no interaction between planting distances and ZnSO₄ fertilizer dose.

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