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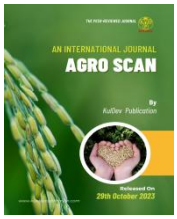

Research Article

Assessment of Performance and Flexibility Examination of Durum Wheat (*Triticum turgidum* var. durum) Varieties in Ambad Tehsil, India's Moisture Stress Areas

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ABSTRACT

During the 2021 to 2022 cropping season, seven Durum wheat varieties were assessed by the Faddis agricultural research center at the Boko research station. The findings showed that there were notable differences in the tested Durum wheat types plant height, grain production, spike length and number of seeds per spike. Higher grain yields were achieved by Mangudo, Ude, Dembi, and Asassa types (3489.7, 3356.7, 3134.7 and 3246.1 kg/ha-1, respectively). When it comes to durum wheat varieties, Yerer recorded the longest spike length at 6.5 cm, Mangudo recorded the shortest spike length at 4.5 cm, and Mangudo recorded the most seeds per spike, followed by Ude (61 and 57, respectively). Ude, Dembi and Mangudo were high-yielding cultivars in the research region, with greater grain yields and maximum seed per spike among the examined kinds.

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Introduction

Ethiopia's mid-altitudes and highlands are major producers of wheat (Triticum spp.). One of the main cereal crops in Ethiopia is planted between the latitudes of 6 and 14 degrees North and the longitudes of 35 and 42 degrees East, with an altitude range of 1600 to 3300 meters. After teff, maize, barley, and sorghum, wheat is the fifth-most significant cereal crop in terms of area under production. It comes in fourth place in terms of total grain output, after teff, sorghum, and maize. Next to maize in productivity, wheat makes up more than 15% of the total amount of grain produced. In Sub-Saharan Africa, Ethiopia is the second-largest producer of wheat. It is a significant crop product that has the potential to play a significant role in helping the nation achieve its agricultural policy goal of self-sufficiency in food grains. The two main types of wheat grown in Ethiopia are bread wheat (*Triticum aestivum*) and durum wheat (*Triticum turgidum* ssp. durum L.). The tetra-ploid hybrid of a diploid wild grass of unknown origin and a diploid T. monococcum (einkorn) is the source of durum wheat (*Triticum* durum Desf.) [1].

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It is often cultivated in the highland vertisols, or thick black clay soils. Durum wheat with a high protein content commands a higher price. Pasta makers in Japan, North America and Europe are the main consumers of durum wheat with a high protein content (over 14%) (ESSO Farm-Tek, 1997). Certain cultivars naturally generate more protein than others, however environmental factors have a greater impact on protein content than genetics. A healthy fertilization process could contribute to higher protein levels. For instance, split nitrogen treatments enhanced grain and total nitrogen absorption in Ethiopia, a country where soil depletion has resulted from continuous cropping [2]. Historically, durum wheat has been a significant crop for the economy, used to make bread, biscuits, and industrial pasta products like noodles, macaroni, and spaghetti. Wheat is recognized as a significant source of protein and energy in Ethiopia. Durum wheat is traditionally used to make various foods including Straw, "kinche", "ganfo," "dabokolo," and "dabo" is useful for thatching roofs and a valuable source of nourishment for animals.

If productivity rises and output is raised, wheat has the potential to enter the export market. By doing this, the foreign money needed to import wheat will be saved. Because they incorporate organic matter into the soil, green manuring is valuable. For true soil fertility, one of the soil's most important components is acknowledged to be organic matter. Two kinds of green manure crops are often used in green manuring [1]. However, compared to bread wheat production, the area dedicated to durum wheat cultivation has been smaller due to its economic significance.

This was caused by:

1. The use of conventional manufacturing methods.
2. The impact of abiotic and biotic variables, such as illnesses.
3. The inadequate use of advised packages or the lack of production inputs (such as better seeds). Past research on the effects of environmental factors and phenotypic-genetic differences on durum wheat production and disease resistance has been reported from Ethiopia [3]. It was well suited to the semi-arid steppes, which are characterized by hot, dry summers and chilly evenings with winter showers [4]. It is particularly well suited to arid regions, such the Mediterranean portion of the Syrian wheat belt, which only gets 300–400 mm of precipitation a year [5]. Additionally, many enhanced durum wheat cultivars have been developed from research centers in Ethiopia. However, this cultivar's seed as well as those of other cultivars were dispersed over the areas and proliferated, allowing research centers and a few farmers to grow them on a small scale. It's true that in Eastern Hararghe, farmers were unaware of and did not cultivate these types. In Faddis, durum wheat cultivation was not widespread in the region. Thus, native sorghum, which took about eight months to develop without rotating annually, was grown by the locals. As a result, the goal of this work is to adapt these many durum types and choose the best disease- and insect-resistant, high-yielding variety.

Supplies and Procedures

An explanation of the experimental location

The Shahagad district Jalna research station in the Ambad area served as the site of the experiment. The Faddis district is located in medium and low land regions, with latitudes between 8°22' and 9°14' North and longitudes between 42°02' and 42°19' East. The district's height ranges from 1200 to 1600 meters above sea level, with lowlands predominating. The area has 400–804 mm of rain on average per year, with minimum and maximum temperatures of 20–25 °C and 30–35 °C, respectively [6].

Materials and designs for experimentation

The study was carried out in the Ambad zone's moisture-stressed regions during the 2021–22 cropping season at the Faddis Agricultural Research Center (FARC) on the Boko research station. In Shahagad, seven (7) varieties of durum wheat, together with a standard check, were planted on station to evaluate their yield performance and adaptability [7-9]. Three replications of a 3 × 4 m plot with a 1 m route between each plot were used in the RCBD design of the experiment. Drilling techniques were used to plant the seeds in a row, 26 cm apart. The management technique was implemented in accordance with the suggestion. There was information gathered on plant height, average kernel size, protein content in the lab, days to 51% emergence, days to 50% flowering, days to maturity, grain production per plot, and thousand seed weight. Diseases that were also noted

on a 1–5 scale included scabs (*Fusarium* head blight), black points, root, crown rots, powdery mildew, smuts, leaf spots and rusts. The variety stands were assessed collaboratively [10,11]. To choose the most adaptable varieties, all agronomic data, disease, and insect records were gathered. The data were then analyzed using ANOVA to determine the significance of the treatments, and the means were compared and ranked using Least Significance Difference (LSD).

Findings and Discussion

At the 5.1 % probability level, analysis of variance (ANOVA) revealed a significant difference between the durum wheat types in terms of grain production, spike length, and seeds per spike. On the other hand days to physiological maturity, days to 50% heading and days to 50% flowering did not significantly vary across kinds.

Yield of grains (kg ha-1)

The results of the analysis of variance (ANOVA) showed that the yield of the varieties varied significantly (Table 1). With a grand mean of 2573.6 kg/ha, the grain yield varied from 3387.5 kg/ha to 1759.7 kg/ha. The Mangudo variety produced the maximum yield (3387.5 kg/ha), which was followed by the Ude (3345.8 kg/ha), Dembi (3112.5 kg ha-1), and Asassa (3101.4 kg ha-1) types. The native check (Kronis) variety produced the lowest yield (1759.7 kg/ha). There was no statistically significant difference found between the Mangudo, Ude, Dembi, and Asassa durum wheat types. The examined types' varying grain yields demonstrated how differently these kinds may be adapted to the study's moisture stress locations. The best performance among these types indicated that they were the most adapted to this setting.

Height of plant (cm)

A significantly significant difference ($p<0.01$) in plant height was found across cultivars by analysis of variance (Table- 1). The height of the plants varied from 54.7 to 87.1 cm. Variety "Quamy" had the greatest height, while variety "Kronis" had the lowest.

According to the statistics, Kronis and Dembi were shorter standing at 59.79 and 54.38 cm, respectively, while Quamy, Asassa, and Ude were taller standing at 84.75, 79.21, and 65.13 cm, respectively. Plant height does not directly correlate with grain output; rather, the tallest plant has the most biomass, which is useful for a variety of reasons. According to this research, the grain yield was not significantly impacted by the length of the spike. The variety Mangudo had the smallest spike length, but it also produced the maximum yield.

Length of spike (cm)

ANOVA analysis revealed that there was a significant difference between the tested kinds (Table 1). The length of the spikes varied from 6.9 cm to 5.8 cm. variation Yerer had the longest spike length (6.7 cm), while variation Mangudo had the shortest (5.1 cm). Mangudo and Ude had the smallest head sizes, while varieties Yerer, Kronis, and Quamy had the greatest spike lengths.

Table 1: Mean Comparison of grain yield and other parameters of durum wheat variety trial at Faddis on station.

TRT	Identification	DH	DF	DM	PH	SL	SPS	YKGHA
1	Quamy	57	65	111	83.5	5.1	36	2943.1
2	Asassa	55	63	111	78.1	4.9	42.67	3101.4
3	Yerer	61	69	115	61	6.5	46.67	2945.8
4	Ude	57	65	115	63.3	4.7	53.67	3345.8
5	Dembi	62	70	110	58.9	4.9	51.67	3112.5
6	Mangudo	57	65	121	61.7	4.5	57.67	3387.5
7	Kronis	57	65	111	52.3	5.5	36.67	1759.7
	CV%	8.1	7.2	3.5	5.7	8.5	15.1	12.7
	5%LSD	8.4	8.4	7.11	6.7	0.8	10.96	663.6
	P value	NS	NS	NS	**	*	*	*

**p<0.01 (highly significant), *p<0.05 (significant) and NS (Not significant)=p>0.05, DH= Days to heading, DF= Days to flowering , DM= Days to mature, PH= Plant height, SL= Spike length, SPS= Seed per spike and YKGHA= Yield kg per hectare.

One seed for each spike

The studied materials showed significant differences, with the range of the seed per spike being 59.44 to 38.12. Mangudo (59.44), Ude (54.97) and Dembi (52.78) had the greatest seed counts, while Kronis (36.67) and Quamy (37.17) had the lowest seed counts. According to the study's results, the number of seeds per spike significantly influences grain output; so, the largest number of seeds per spike produced the highest grain yield, while the lowest number of seeds per spike produced the lowest grain yield (Table 1).

In summary

The results of this research demonstrated that the durum wheat cultivars' responses to the study area's drought stress varied. Significant (P<0.05) variations in the parameters examined across all durum wheat types were found in the study region, according to the analysis of variance. The variety Mangudo had the greatest grain production and seed per spike, according to the data, whereas the standard check showed the lowest. Plants of the Quamy, Asassa and Ude kinds had the greatest plant heights, while the Kronis and Dembi types had the shortest. In general, the best results were obtained with the Durum wheat types Mangudo, Ude and Dembi in terms of yield and yielding component (seed per spike). Therefore, in order to promote sustainable durum wheat output and farmer productivity in the research region, these varieties were suggested and must be proven with a standard check for further assessment in addition to their enhanced production packages.

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