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Science brief from the ZEF-UNESCO project on Sustainable Management of Land and Water Resources in Khorezm, Uzbekistan

Wheat in Khorezm, Uzbekistan: High yields but low quality

Summary

The ZEF/UNESCO research project developed options to improve the quality of bread wheat in the irrigated regions of Uzbekistan without loss of yield quantities.

Background

Winter wheat is the main cereal crop grown for making bread in Uzbekistan today. It is a comparatively new crop for the country and only became widespread in the Uzbek agricultural fields in the mid-1990s as a result of the National Program on Self-Sufficiency in Foods. The area of wheat cultivation in Khorezm, the ZEF/UNESCO project region, was more than doubled from 37 thousand ha to 86 thousand ha in the period 1990 – 2003. The government mainly increased wheat cultivation by replacing forage crops and undertook enormous efforts to achieve this expansion. Wheat producers have to fulfill certain targets, similar to cotton producers. However, in both cases, the government also provides subsidies and credit facilities to farmers.



Fig. 1: Different types of bread sold at the Urgench market in Khorezm

Research

In the nineties, the Uzbek Wheat Research Institute developed recommendations on nitrogen fertilization and management strategies for agricultural production in order to increase wheat yields. Since 2000, researchers from ZEF have also been conducting wheat research on local farmers' fields within the framework of ZEF's project entitled "Ecological and economic restructuring of land and water use in Khorezm". This has been done in close cooperation with Khorezmian farmers. The results confirm the recommendations of the Uzbek Wheat Research Institute: A nitrogen fertilizer application of between 160 and 180 kg per hectare will give the highest wheat yield (Fig. 2).

However, this research has also shown that Khorezmian wheat quality is inferior to the spring wheat grown in neighboring northern Kazakhstan. The baking quality and nutritional value of wheat used for human consumption is measured by the gluten and protein content in wheat kernels.



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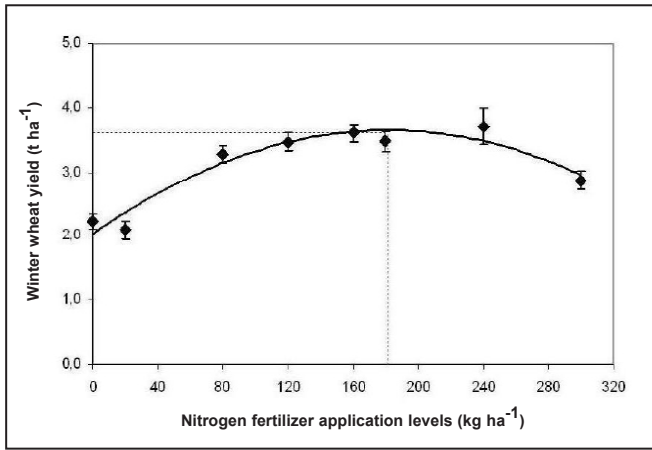


Fig. 2: Khorezmian wheat yield for different nitrogen fertilizer application levels

According to national and international wheat quality classifications for bread-making, medium quality wheat should have a gluten content of more than 23% and a raw protein content of more than 13%. The Khorezmian wheat, however, does not reach these threshold values, even when applying the recommended amounts of fertilizer (Fig. 3) and is therefore classified nationally and internationally as low quality.

Recommendations

In order to improve the quality of Khorezmian wheat, and, subsequently, also increase its market and export value it is necessary to support and encourage farmers to produce better quality wheat, for example by offering adequate reimbursement for high quality rather than for quantity alone. Also, the regular monitoring of protein content as well as other quality aspects of wheat ought to be part of the fertilizer recommendations. This will make it possible to optimize nitrogen and water management.



Fig. 4: Wheat grown under different nitrogen fertilizer regimes and application timings

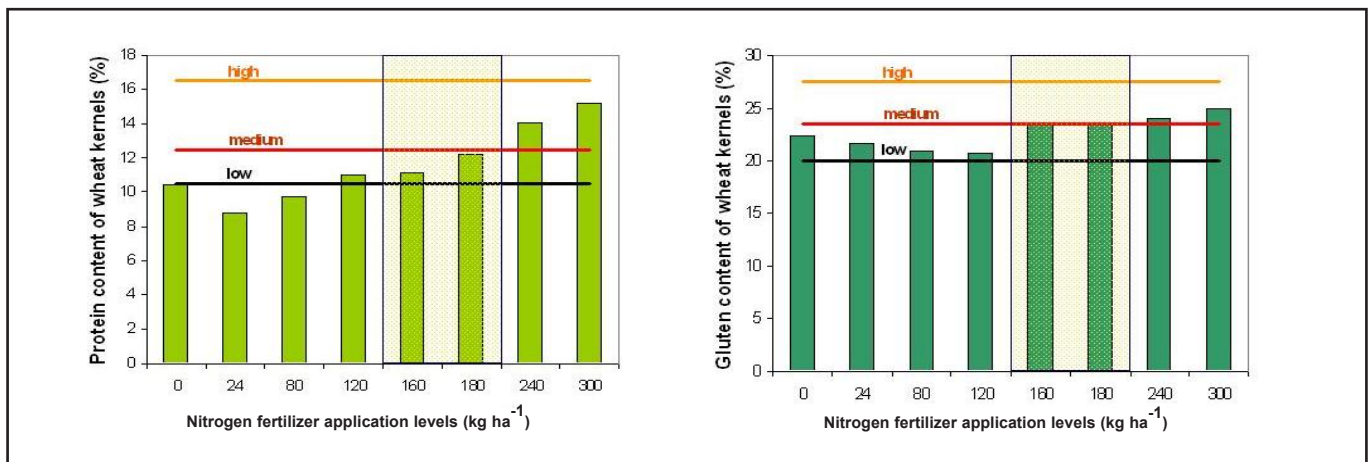


Fig. 3: Protein and gluten content of Khorezmian wheat kernels for different nitrogen fertilizer application levels

Conclusions

Based on our research, we conclude that by following the present recommendations for fertilizer applied to wheat, it is possible to achieve high yields to meet the population's needs for wheat. However, this currently still implies low quality. Moreover, the State Mills in Khorezm only analyze the gluten content and quality for wheat that will be used for flour production. The protein content is only checked for wheat that will be used for fodder. Our research shows that it is possible to improve the quality of wheat by increasing the nitrogen fertilizer uptake into the wheat kernels. The late application of nitrogen fertilizer at heading, for example, drastically increased the nitrogen in the kernels, and consequently improved the protein content (Fig. 4). Furthermore, avoiding over-irrigation, but applying water at critical times of wheat growth, e.g., at the start of tilling, stem elongation, anthesis/flowering, and grain milk development, will enhance the uptake and thus increase fertilizer use efficiency.

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