Research Findings Report of the Agronomy Department Students, Faculty of Agriculture, Farah University, for the 1404–1405 Agricultural Year: Scientific Findings and Practical Recommendations for Improving Irrigated Wheat Production and Managing Barley Cultivation

Introduction

During the 1404–1405 agricultural year, the Agronomy Department of the Faculty of Agriculture at Farah University conducted scientific research at the Faculty's research farm. The main objectives were to improve agricultural productivity, promote the efficient use of resources, and develop appropriate scientific solutions suited to the climatic conditions of Farah Province.

The research included an investigation into the effects of urea, diammonium phosphate (DAP), and potassium sulfate fertilizers on irrigated wheat yield. It also examined the effects of sowing dates on the growth and yield of cultivated and wild barley.

Considering the importance of wheat and barley in cereal production, food security, and the livelihoods of farming households, the findings of these studies can contribute significantly to fertilizer management, the selection of appropriate sowing dates, and farmers' economic decision-making.

1. Effects of Chemical Fertilizers on Irrigated Wheat Yield

This study investigated the effects of urea, diammonium phosphate (DAP), potassium sulfate, and their different combinations on the growth and yield of irrigated wheat under the climatic conditions of Farah city. The experiment was conducted using a Randomized Complete Block Design (RCBD), with eight treatments and three replications.

The characteristics evaluated included plant height, dry weight, growth indices, number of tillers, spike length, number of grains per spike, thousand-grain weight, grain yield, and straw yield. The economic performance of the different treatments was also assessed in terms of net income and production costs.

Key Research Findings

The results showed that the combined application of urea, diammonium phosphate, and potassium sulfate produced better results for most growth and yield characteristics. However, due to the high cost of fertilizers, this treatment was not the most economically advantageous option.

In contrast, the application of urea alone was identified as the most economical option among the treatments evaluated, generating a reported net income of AFN 23,698 per hectare.

This finding demonstrates that increased crop yield alone is not a sufficient criterion for selecting a fertilizer application strategy. The cost of production inputs and the income generated from crop sales must also be taken into consideration.

Practical Recommendations for Wheat Farmers

- **Avoid unnecessary fertilizer application:** Applying more fertilizer does not necessarily result in greater profit. The type and quantity of fertilizer should be determined according to crop requirements, soil conditions, and field characteristics.
- **Calculate costs and income:** When selecting a fertilizer management program, compare fertilizer prices, labor costs, irrigation expenses, and other production costs with the income expected from wheat sales.
- **Consider water quality and soil conditions:** Soil salinity, alkalinity, and poor-quality irrigation water can restrict wheat growth. Therefore, appropriate water management and the maintenance of soil fertility should be considered alongside fertilizer application.
- **Adapt fertilizer recommendations to field conditions:** The results obtained from urea application in this study do not mean that urea alone is suitable for every field. Fertilizer selection should be based on local conditions and the crop's nutritional requirements.

2. Effects of Sowing Dates on the Yield of Cultivated and Wild Barley

This study investigated the effects of three different sowing dates on the growth, yield, and yield components of cultivated barley (*Hordeum vulgare*) and wild barley (*Hordeum spontaneum*) under the climatic conditions of Farah Province.

The experiment was conducted using a factorial arrangement within a Randomized Complete Block Design (RCBD), with four replications. It included six treatment combinations and a total of 24 plots, each measuring four square meters.

The characteristics evaluated included plant height, number of tillers, spike length, number of grains per spike, grain weight per spike, thousand-grain weight, grain yield, straw yield, and biological yield.

Key Research Findings

The statistical analysis showed that sowing date had a statistically significant effect on the number of tillers, grain weight per spike, grain yield, straw yield, and biological yield.

Barley type also had a significant effect on several characteristics, including the number of grains per spike, grain weight, straw yield, and biological yield.

Furthermore, the interaction between barley type and sowing date had a significant effect on plant height, grain weight per spike, grain yield, straw yield, and biological yield. These findings indicate that cultivated and wild barley do not respond uniformly to different sowing dates.

Key Yield Findings

- **First sowing date:** Cultivated barley produced 10,702.88 kg of straw per hectare and a biological yield of 12,250 kg per hectare. Based on the reported values, these were the highest yields recorded for these characteristics.
- **Second sowing date:** Wild barley produced a grain yield of 2,083.80 kg per hectare, the highest grain yield among the treatment combinations tested.
- **Other characteristics:** Spike length and thousand-grain weight were not significantly affected by the factors investigated.

These findings indicate that the selection of barley type and sowing date should be based on production objectives, environmental conditions, and the specific characteristics of each field.

Practical Recommendations for Barley Farmers

- **Match the sowing date to the production objective:** The findings indicated that the first sowing date was favorable for straw and biological yield, whereas the second sowing date produced the best grain yield.

- **Exercise caution when considering wild barley cultivation:** The high grain yield of wild barley in one experimental treatment is not, by itself, sufficient justification for recommending its large-scale cultivation as a commercial crop. Grain quality, harvesting convenience, market acceptance, and other relevant characteristics should also be evaluated.
- **Consider climatic conditions and soil moisture:** The appropriate sowing date may vary according to temperature, water availability, and local environmental conditions. Therefore, sowing dates should be adapted to local circumstances.
- **Compare different practices in the field:** Where possible, allocate a portion of the land to compare different sowing dates and record the yields and costs associated with each method.

3. Fundamental Principles for Increasing Agricultural Productivity and Reducing Production Costs

Based on the findings of these two studies, applying the following principles can help improve the management of wheat and barley fields:

1. Use healthy, high-quality seeds suitable for local conditions.
2. Adjust fertilizer application according to soil fertility and crop nutrient requirements.
3. Manage irrigation efficiently and avoid unnecessary water consumption.
4. Select sowing dates according to crop type, production objectives, and climatic conditions.
5. Record crop yields, production costs, and income from product sales.
6. Consult agricultural specialists and extension experts regarding fertilizer selection and appropriate cultivation practices.

An Important Message to the Esteemed Farmers of Farah Province

Higher yields do not always mean higher profits.

The wheat research findings showed that the treatment producing the best growth and yield characteristics was not necessarily the most economical option. Similarly, the barley study demonstrated that the sowing date most suitable for grain production may differ from the date most suitable for straw and biological yield production.

Therefore, farmers should consider soil and water conditions, production objectives, agricultural costs, and market prices when selecting fertilizer application strategies and determining sowing dates.

These findings are based on experiments conducted at the research farm of the Faculty of Agriculture at Farah University. Since field conditions vary, the recommendations should be implemented after considering local circumstances and consulting agricultural specialists.

The Agronomy Department of the Faculty of Agriculture at Farah University continues to support the advancement of agricultural knowledge, improved field management, and sustainable agricultural production in Farah Province by conducting scientific research and sharing its findings with farmers in ways that encourage their participation and practical use of the results.