

THE EFFECT OF SUSPENSION APPLICATION RATES AND TIMING ON THE CHARACTERISTICS OF WINTER WHEAT EARS

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ABSTRACT

This study examines the effects of suspension application rates and timing on the characteristics of winter wheat ears. The morphological and quantitative characteristics of wheat ears, including ear length, number of spikelets per ear, number of grains per ear, and grain weight per ear, are important indicators of crop development and yield potential. The application of nutrient suspensions at appropriate rates and growth stages may improve plant nutrition, support ear development, and influence the formation of yield components.

Keywords: Winter wheat, nutrient suspension, application rate, application timing, ear characteristics, ear length, number of grains per ear, grain weight per ear, yield components, foliar fertilization.

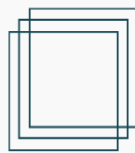
INTRODUCTION

Winter wheat (*Triticum aestivum* L.) is an important cereal crop in Uzbekistan, and improving its productivity requires the appropriate selection of wheat varieties, balanced mineral nutrition, effective irrigation, and timely agronomic practices. The characteristics of the wheat ear are particularly important because they contribute directly to the formation of grain yield. These characteristics include ear length, number of spikelets per ear, number of grains per ear, and grain weight per ear.

The application of nutrient suspensions through the leaves is one method used to supplement the nutritional requirements of winter wheat during its growing season. The effectiveness of this practice depends on the suspension composition, application rate, timing, crop development stage, and soil and climatic conditions.

MAIN PART

A suspension used for foliar feeding may contain urea, macroelements, micronutrients, or combinations of these components. However, the result depends on the composition and concentration of the suspension, the crop's nutritional status, the environmental conditions, and the growth stage during treatment. Therefore, applying a higher rate does not automatically guarantee a higher yield.



Uzbekistan-based agricultural research provides relevant evidence for examining this subject. For example, Sh. R. Djabborov's dissertation abstract, catalogued in the Ziyonet educational information network in 2023, specifically addresses foliar feeding of winter wheat under irrigated typical grey-soil conditions. Research published in Uzbekistani agricultural journals also examines the relationship between foliar nutrition, wheat varieties, development stages, and yield components.

The analysis below distinguishes between findings reported by local research and scientific interpretations that should be tested under specific field conditions.

The application rate is one of the main factors determining the effectiveness of foliar nutrition in winter wheat. It refers to the quantity of fertilizer or nutrient suspension applied per hectare or the concentration of nutrients in the working solution. These measurements must be distinguished because a rate expressed in kilograms per hectare is not the same as a concentration expressed as a percentage.

The Uzbekistani dissertation abstract by Shavkat Razzoqovich Djabborov, published in 2023, specifically identifies the rates and timing of urea-based suspension application as research factors affecting winter wheat growth, yield, and grain quality under irrigated typical grey-soil conditions in Tashkent Region. This makes it directly relevant to the subject of the present analysis.

A low suspension rate may be useful when the crop has a relatively small nutrient deficiency or when the objective is to supplement nutrients supplied through the soil.

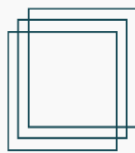
For example, suppose an experiment compares a control treatment with a low-rate foliar suspension. If the control plants have an average ear length of 9.5 cm and treated plants have an average ear length of 9.8 cm, the difference is 0.3 cm. This would indicate a possible positive response, but it would not establish statistical significance without replicate measurements and appropriate statistical analysis.

Similarly, if the control plants produce an average of 35 grains per ear and the treated plants produce 37, the increase is two grains per ear, or approximately 5.7%. This result could be agronomically useful if it is repeatable across plots and does not cause a reduction in grain weight.

These numbers are hypothetical examples for explaining the analysis; they are not results taken from a published Uzbekistani experiment.

The main advantage of a low application rate is that it may reduce fertilizer costs and the risk of leaf injury. Its limitation is that the response may be small if the crop has a substantial nutrient deficiency.

A moderate rate may provide a more effective balance between nutrient availability, crop demand, and the risk of leaf damage. The appropriate rate, however, depends on the product formulation, nutrient concentration, wheat variety, weather, and existing soil fertility.



Consider a hypothetical experiment with four treatments:

The control receives no foliar suspension. Its average ear length is 9.5 cm, with 35 grains per ear and a grain weight of 1.4 g per ear.

The low-rate treatment produces ears averaging 9.8 cm, with 37 grains and a grain weight of 1.45 g per ear.

The moderate-rate treatment produces ears averaging 10.2 cm, with 40 grains and a grain weight of 1.55 g per ear.

The high-rate treatment produces ears averaging 10.1 cm, with 39 grains and a grain weight of 1.52 g per ear.

In this hypothetical example, the moderate rate performs better than both the control and the high rate. The result illustrates an important principle: the response to fertilizer does not necessarily increase in direct proportion to the amount applied.

The figures are illustrative only. To establish the actual optimum rate, a field experiment must measure the crop's response under local conditions.

Tillering is the stage when the wheat plant develops additional shoots. Some of these shoots may become productive stems and subsequently produce ears.

Foliar nutrition during this stage may support plant development when nutrients are limiting. However, it cannot guarantee that every additional shoot will survive or produce a fertile ear.

For example, imagine that two experimental plots each contain 100 wheat plants. In the control plot, 280 productive stems are recorded per square metre. In the treated plot, 310 productive stems are recorded per square metre.

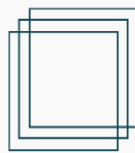
The increase is 30 productive stems per square metre. This may indicate improved productive tillering, but the researcher must also determine whether the additional stems form ears and produce grain.

This distinction matters because more stems do not automatically mean more grain yield. Excessive competition for water, light, and nutrients can reduce the performance of individual ears.

An Uzbekistani agricultural journal article published on 17 October 2026 discusses foliar feeding in winter wheat, including treatments at tillering and stem elongation. It reports grain yields of 76.3-82.3 centners per hectare for specific combinations of seed treatment, herbicide use, and foliar feeding. These results support the importance of evaluating complete treatment programmes, but they do not isolate the effect of suspension timing alone.

Ear emergence is particularly relevant to the present topic because the ear is directly involved in determining the number of spikelets and potential grain-bearing sites.

An application at this stage may help address a nutrient shortage, provided the nutrient can be absorbed effectively and the crop remains responsive. However, many aspects of ear formation are determined earlier in plant development, so an application at ear emergence cannot necessarily compensate for earlier stress or missing developmental structures.



Consider a hypothetical comparison in which the control treatment produces ears containing 38 grains, while a treatment applied at ear emergence produces 40 grains per ear. The increase is two grains, or approximately 5.3%.

This result would indicate a positive numerical difference, but the researcher would still need to determine whether it is statistically significant and whether grain weight and total yield also improve.

The rate and timing should therefore be considered together. A moderate rate at an appropriate stage may be more effective than a high rate applied when the crop has limited capacity to respond.

Ear length is a basic morphological indicator used to compare wheat treatments. It is influenced by variety, genetic characteristics, crop nutrition, water availability, and developmental conditions.

Longer ears may contain more spikelets, but the relationship is not universal. Two ears of equal length may differ considerably in the number of fertile spikelets and grains.

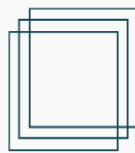
A particularly relevant Uzbekistani source is Toshkentboyeva's 2025 study of the Yaksart and Jasmina varieties. Its reported findings indicate that foliar feeding affected biometric characteristics, including ear length, and that the magnitude of the response varied with variety and suspension concentration.

CONCLUSION

The effect of suspension application rates and timing on winter wheat ear characteristics is a multi-factorial issue. The rate determines how much nutrient is supplied, while the timing determines whether the crop can use those nutrients effectively at a particular developmental stage.

The Uzbekistani sources reviewed provide relevant evidence concerning urea-based suspension treatments, foliar micronutrient feeding, varietal responses, developmental stages, and wheat yield components. The most directly relevant source is Djabborov's 2023 dissertation abstract, while the 2025 Yaksart and Jasmina study provides useful evidence concerning varietal and biometric responses. Other local studies contribute supporting information about ear yield components, nutrient timing, and regional soil conditions.

The key scientific conclusion is that the best suspension rate cannot be determined independently of application timing, wheat variety, soil fertility, irrigation, weather, and the nutrient composition of the suspension. Ear length, spikelets per ear, grains per ear, grain weight per ear, productive ears per square metre, and final yield should all be considered.



REFERENCES

1. Djabborov, Sh. R. (2023). Sug'oriladigan tipik bo'z tuproqlar sharoitida kuzgi bug'doyni ildizdan tashqari oziqlantirishning don hosili va sifatiga ta'siri. Ziyonet. <https://library.ziynet.uz/book/128150>
2. Toshkentboyeva, F. I. (2025). Yaksart va Jasmina navlarining biometrik ko'rsatkichlariga o'simliklarni ildizidan tashqari oziqlantirishning ta'siri. Agro ilm, Special Issue 1 (107). https://api.qxjurnal.uz/media/issues/%D0%9C%D0%B0%D1%85%D1%81%D1%83%D1%81_%D1%81%D0%BE%D0%BD_SamATI.pdf
3. Bobomurotova, M. I. (2026). Kuzgi bug'doyni maqbul me'yor va muddatlarda oziqlantirishning boshqariladigan hosil elementlariga ta'siri. Agro kimyo himoya va o'simliklar karantini, No. 6 (121). <https://agrokarantin.uz/articles/1810/>
4. Toshkentboyeva, F. I. (2024). Urug'lik donining hosil elementlariga kuzgi bug'doy navlarini ildizidan tashqari oziqlantirishning keyingi reproduksiyadagi ta'siri. Agro kimyo himoya va o'simliklar karantini, Special Issue 2 (99). <https://agrokarantin.uz/articles/2766/>