

Effect of nitrogen and irrigation on the development of bunt disease in bread wheat

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Abstract

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Nitrogen and water are recognized to be positively related to growth and production of bread wheat (*Triticum aestivum*). Little is known about the effect of nitrogen and water on the infection of bunt disease caused by *Tilletia foetida*. An experiment in plastic pots have demonstrated that a nitrogen supplement to bread wheat (cv. "Byrsa") at seeding, reduced bunt disease development. However, infection was almost the same over three water regimes applied during the first two months of wheat growth.

Key words: Bunt, bread wheat, nitrogen, Tunisia.

Introduction

It is known that when wheat reaches the second leaf stage it becomes resistant to bunt disease. Since the pathogenic species of *Tilletia* germinates within 2 to 4 weeks, wheat plant can escape from infection with *Tilletia*, if the wheat seed germinates and the seedling emerges quickly (7). Some authors have indicated that conditions unfavorable to wheat growth, such as deep sowing (6), clay soil (5) and low temperatures of air and soil (1, 2) increase bunt infection. In the present work, two factors, nitrogen and water, known to stimulate germination and emergence of wheat were evaluated. Understanding how these two factors affect infection will offer a cultural means for wheat protection against *Tilletia* species.

Tilletia foetida was identified using the criteria reported previously (3). It was collected from infected seeds of bread wheat planted at the experimental station of Ecole Supérieure d' Agriculture du Kef in a semi-arid area, North-West of Tunisia. Seeds of the wheat host-plant (cv. "Byrsa") were inoculated by mixing them with a ground infected bread wheat seeds. The inoculum was applied at a rate of 10 g per kg. A 6.5 x 1 plastic pots containing 5 kg of clay loam soil placed in a greenhouse, 5 wheat plants per pot. Each treatment, which is a factorial combination between two levels of nitrogen (N) and water (W), was replicated 4 times. Three levels of nitrogen as ammonium nitrate with 33.5 % N were supplemented at seeding with the equivalent rates of 0, 40 and 80 kg ammonium nitrate per ha. Tap water was used for irrigation, which started at seeding and was applied once every other week. Water regimes were the equivalent of 10, 20 and 30 mm/ha during the first two months of wheat growth. For the rest of growth and development cycle, pots were uniformly watered at the equivalent of 20 mm/ha. The experiment was conducted in a Complete Randomized Design (CRD). Data analysis was conducted using SAS (4) and means were separated with the LSD test at 5% level of probability.

Results and Discussion

Results showed that without nitrogen, infection of spikes reached 27.2%. However, only 2.7% of spikes were infected when nitrogen was supplemented at the rate of 80 kg ammonium nitrate per ha. An intermediary degree of bunt infection with 13.2% infected spikes was obtained when nitrogen was supplemented at the rate of 40 kg ammonium nitrate per ha (Fig. 1). The infection level did not vary significantly with different levels of irrigation. The percentage of bunted spikes ranged between 12.5 and 17.5% (Fig. 2). No interaction between nitrogen and water levels in relation to infection was found.

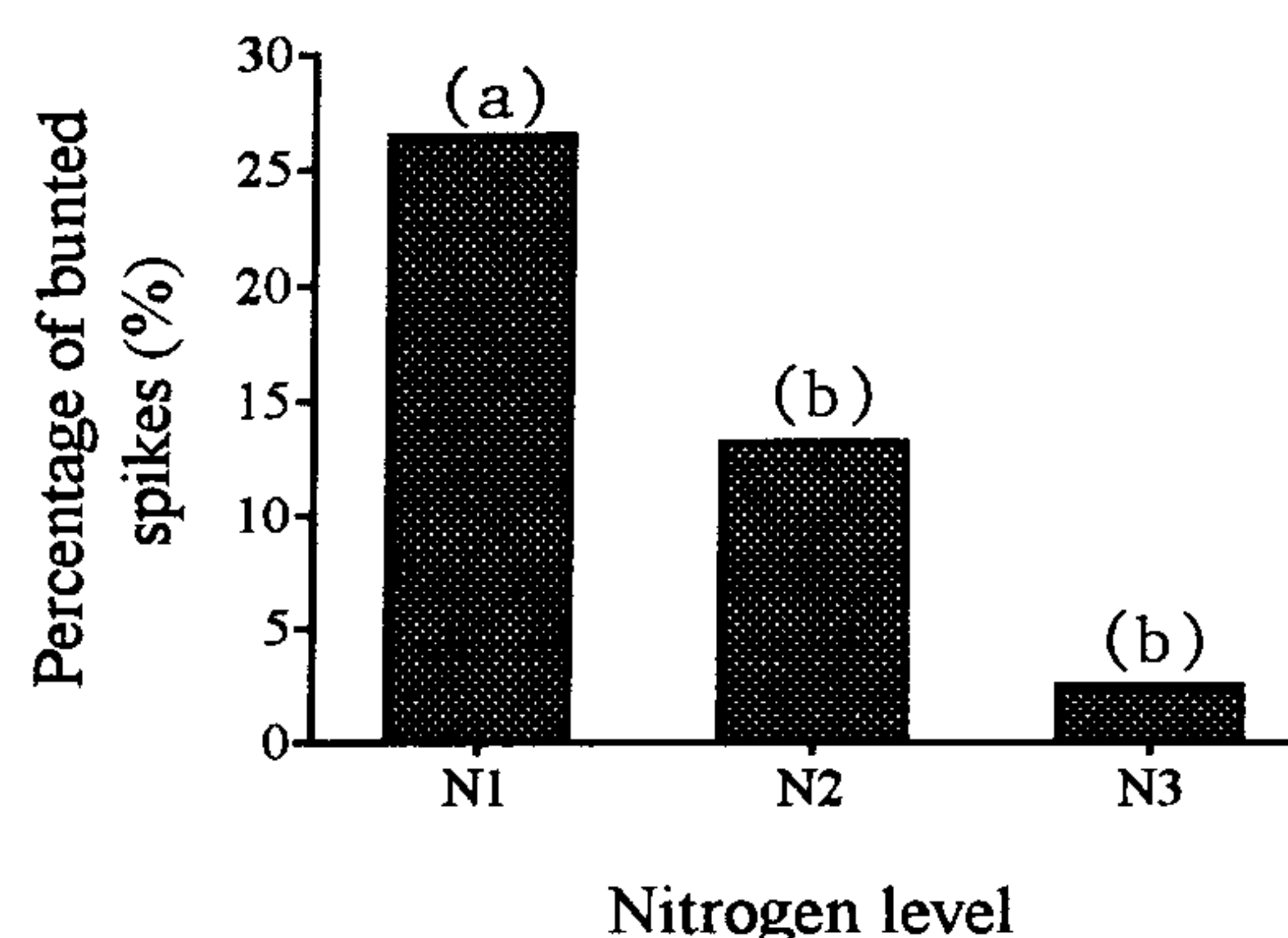


Figure 1. The differential effect of Nitrogen levels supplemented at seeding on the development of bunt disease in bread wheat, (N1, N2 and N3 represent the Nitrogen application rates at 0, 40 and 80 Kg ammonium nitrate (33.5%) per ha, respectively).

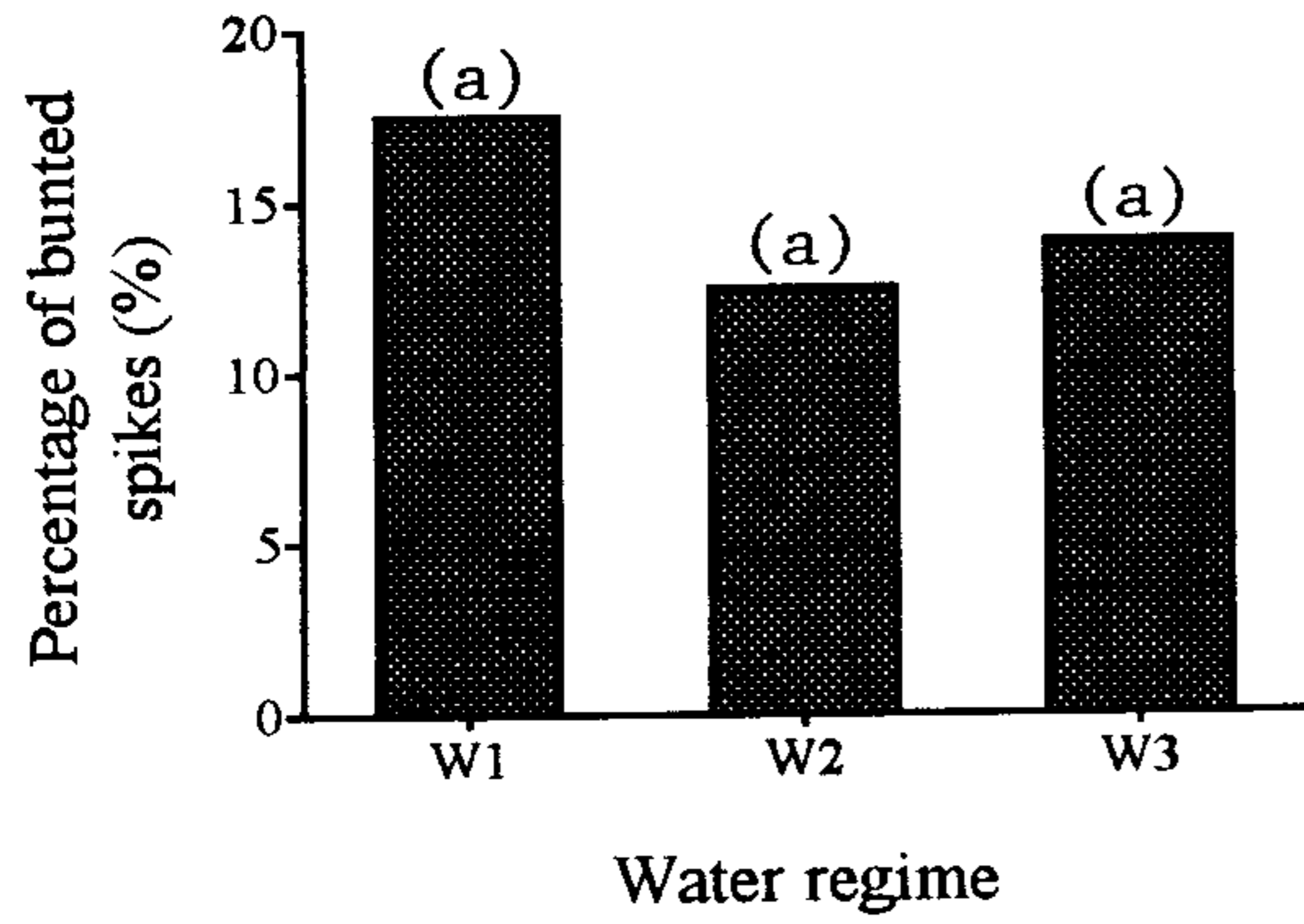


Figure 2. The differential effect of water regimes two months after seeding on the development of bunt disease in bread wheat, (W1, W2 and W3 represent the irrigation regimes equivalent of 10, 20 and 30 mm/ha, respectively).

The growth of bread wheat without nitrogen was slow which may have facilitated infection. Even though, no significant difference was obtained among the three water levels, the lowest regime appeared to favor infection. Results obtained supported the hypothesis that wheat, when grown in favorable conditions, germinates and emerges quickly enough to out grow the fungus spores. An additional field experiment is in progress to examine the validity of these results, obtained in plastic pots under green house conditions.

الملخص

نصراوي، بوزيد، علي دالي رضواني، تاكهيكو تيراشيما ومنصف بن حمودة. 1996. تأثير النيتروجين والري في تطور التفحم المغطى على القمح الطري. مجلة وقاية النبات العربية. 14(2): 97-96.

من المعروف علمياً أن نمو القمح الطري *Triticum aestivum* مرتبط إيجابياً مع التسميد الأزوتي والسقاية. على أن أثر هذين العاملين في مدى الإصابة بمرض التفحم المغطى الذي يحدثه الفطر *Tilletia foetida* غير معروف بشكل واضح. وقد أظهرت نتائج تجربة تم تنفيذها في الدفيئة بأن إضافة النيتروجين أثناء الزراعة، خفضت تطور مرض التفحم، على أن مستوى الإصابة لم يتأثر بالمستويات المائية الثلاثة التي طبقت في الشهرين الأولين من نمو نبات القمح.

كلمات مفتاحية: التفحم، القمح الطري، النيتروجين، تونس.

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