

RESEARCH WITH IMPACT

THE CHALLENGE:

Wheat crown rot is a fungal disease that results in significant economic loss in Morocco and in wheat-growing areas around the world. The disease is caused by the soil-borne fungus *Fusarium culmorum*. Ultimately the fungus causes the heads of wheat plants to turn white and die prematurely. This disease is commonly known as "whitehead", and is easily identified in the field. These whiteheads contain either no grain or only shriveled kernels.

In the dryland wheat production areas of Morocco, crown rot reduces yields for many farmers. Earlier research has linked the severity of crown rot with drought conditions and unbalanced plant nutrition.

Efforts to control crown rot have been limited by a poor understanding of the interacting factors associated with crop management and disease development, especially the benefits of balanced nutrition.

THE RESEARCH SOLUTION:

IPNI and partners in Morocco initiated a research effort to investigate the interaction of wheat crown rot disease with balanced plant nutrition. Non-chemical solutions to controlling this disease in durum wheat were preferred amongst farmers.

Experiments were established in three important wheat production regions in Morocco (Chaouia, Doukkala, and Abda) to evaluate the potential benefits of improving plant health as a means of disease suppression. Durum wheat was grown at each location with supplemental irrigation or rainfall. The seed for half of the field was inoculated with *Fusarium culmorum* spores to ensure that infection was likely to occur. Nitrogen was applied as either urea or ammonium nitrate. Potassium sulfate was applied to half of the treatments and diammonium phosphate (DAP) was uniformly applied to the entire field.



Severe case of crown rot disease showing the formation of whiteheads in durum wheat.

Improved Plant Nutrition Helps Moroccan Farmers Control Wheat Crown Rot

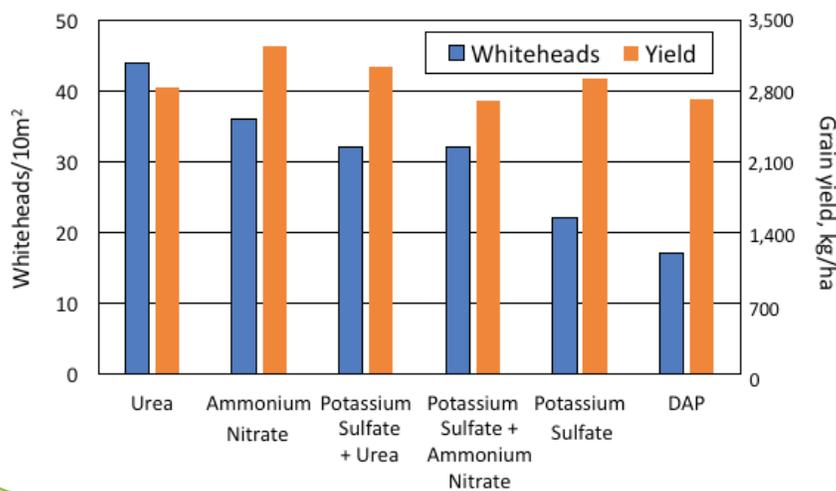
THE RESULTS:

Nitrogen Source: Under these rain-fed conditions and within disease-prone regions, the use of urea fertilizer as the nitrogen source resulted in more disease development and severity, which led to lower grain yield compared to plots fertilized with ammonium nitrate as the nitrogen source.

Potassium Nutrition: Wheat that received nitrogen had at least twice as many whiteheads compared to wheat that did not receive nitrogen fertilizer. However, fertilization with potassium sulfate consistently reduced the development and severity of wheat crown rot, while still maintaining or improving grain yield.

Recommendation: All wheat farmers are encouraged to periodically take soil samples to assess the nutrient status of their fields. However, farmers with a history of crop damage from wheat crown rot are especially urged to consider adding potassium sulfate with their standard application of DAP. Additionally, switching the nitrogen fertilizer source from urea to ammonium nitrate may also provide additional crop protection from crown rot.

The benefit of potassium in reducing the negative effect of wheat crown rot is a promising finding to help resource-limited wheat farmers deal with yield losses.



The incidence of wheat whiteheads caused by crown rot and wheat grain yield as influenced by the sources of plant nutrition in dryland fields. All treatments received a uniform application of diammonium phosphate (DAP).



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