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Commentary

CLIMATE IMPACT ON ERGOT AND ERGOT ALKALOIDS IN ITALIAN WHEAT PRODUCTION

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DESCRIPTION

Ergot, caused by the fungal pathogen Claviceps purpurea, is a significant concern for wheat production, particularly due to its production of toxic ergot alkaloids. These compounds pose severe health risks to humans and animals when contaminated grains are consumed. In Italy, wheat is a staple crop, and understanding how climate change affects the occurrence of ergot and its alkaloids is crucial for ensuring food safety and agricultural sustainability. The incidence of ergot in wheat fields is closely linked to climatic conditions, as the lifecycle of C. purpurea depends on specific environmental parameters. Temperature and moisture levels are key factors that influence the germination of ergot sclerotia the resting structure of the fungus and the subsequent infection of wheat flowers. Optimal conditions for ergot development include cool, wet weather during the flowering period of wheat. Italy's diverse climate, ranging from the temperate north to the Mediterranean south, means that the risk of ergot infection varies significantly across the country. In northern Italy, where the climate is cooler and wetter, the conditions are more favorable for ergot proliferation. Spring and early summer rains, coupled with moderate temperatures, create an ideal environment for the fungus. Consequently, wheat crops in regions like the Po Valley are at a higher risk of ergot infection. Studies have shown that years with higher rainfall during the flowering period of wheat correlate with increased ergot contamination. This relationship highlights the vulnerability of northern Italian wheat production to changes in climate patterns, particularly with the predicted increase in extreme weather events due to climate change. In contrast, southern Italy's warmer and drier climate generally results in lower incidences of ergot. However, climate change models predict an increase in extreme weather events, including irregular rainfall and unseasonable temperature fluctuations, which could alter the current dynamics. If southern regions experience increased humidity and cooler temperatures during critical periods of wheat development, the risk of ergot outbreaks could rise. This shift would pose a new challenge for wheat farmers in these traditionally lower-risk areas. Ergot alkaloids, the toxic compounds produced by C. purpurea, also show variability in concentration based on environmental conditions. Temperature and moisture not only affect the fungal infection rate but also influence the type and amount of alkaloids produced. Warmer temperatures and high humidity levels can lead to higher concentrations of certain ergot alkaloids, exacerbating the health risks associated with contaminated wheat. In Italy, monitoring the levels of these alkaloids is crucial, especially given the potential for climate change to modify the alkaloid profile in infected grains. The impact of climate change on ergot and ergot alkaloids extends beyond the field. Post-harvest handling and storage conditions are critical in managing ergot contamination. Increased temperatures and humidity levels can promote the growth of the fungus on stored grains, leading to higher alkaloid concentrations. Implementing improved storage practices and robust monitoring systems will be essential in mitigating these risks. Furthermore, climate change may also affect the geographical distribution of ergot. As temperatures rise, regions previously unsuitable for C. purpurea may become vulnerable. This shift could lead to new ergot hotspots in Italy, complicating efforts to manage the disease. Farmers and agricultural stakeholders need to adapt to these changes through the development of resistant wheat varieties and the implementation of integrated pest management strategies C. purpurea. In conclusion, the occurrence of ergot and ergot alkaloids in Italian wheat is heavily influenced by climatic conditions. As climate change continues to alter temperature and moisture patterns, the risk of ergot infection and alkaloid contamination is likely to increase, particularly in regions currently deemed low-risk. Addressing this issue requires a multifaceted approach, including vigilant monitoring, improved agricultural practices, and the development of resistant wheat strains. Understanding and adapting to these climatic impacts is essential for safeguarding Italy's wheat production and ensuring the health of consumers.

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CONFLICT OF INTEREST

We have no conflict of interests to disclose and the manuscript has been read and approved by all named authors.