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Prevalence of *Fusarium* mycotoxins in cereals harvested in Croatia

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INTRODUCTION & AIM

Cereal grains are highly susceptible to contamination by various moulds, particularly field fungi of the Fusarium genus. These fungi not only compromise grain quality but also frequently produce toxic secondary metabolites known as mycotoxins (Manandhar et al., 2018). In the context of Croatian cereal production, Fusarium species—most notably F. graminearum and F. culmorum, both known producers of trichothecenes—have been identified as the most prevalent (Pleadin et al., 2013). Accurate identification of these pathogens is essential for the development and implementation of effective post-harvest handling strategies aimed at minimizing mycotoxin accumulation, which poses significant health risks to both humans and animals.Therefore, the objective of this study was to assess the prevalence and co-occurrence of 16 Fusarium mycotoxins, including their modified forms, in cereal grains harvested across various regions of Croatia.

METHOD

During the 2024 harvest season, a total of 137 grain samples were collected immediately after harvest. The sample set included maize (n = 66), wheat (n = 30), barley (n = 17), triticale (n = 12), and oat (n = 12), and sampling was conducted across three regions of Croatia (Eastern, Northern, and Central). All samples were homogenized and stored at −20 °C until mycotoxin analysis was performed.Sample extraction was conducted using an acidified acetonitrile/water mixture (79:20:1, v/v/v) over a two-hour period. After extraction, samples were centrifuged and subsequently filtered through 0.2 µm polytetrafluoroethylene (PTFE) syringe filters. Quantification of mycotoxins was carried out by liquid chromatography coupled with tandem mass spectrometry (LC-MS/MS), utilizing an Agilent 1260 Infinity high-performance liquid chromatography (HPLC) system coupled to an Agilent 6470 triple quadrupole mass spectrometer (Agilent Technologies, Santa Clara, CA, USA)

Figure 1. Sampling regions

RESULTS & DISCUSSION

Deoxynivalenol (DON) was identified as the most prevalent mycotoxin in wheat and triticale samples, with occurrence rates of 73.3% and 91.7%, respectively. This was followed by deoxynivalenol-3-glucoside (DON-3G) and HT-2 toxin. In barley samples, DON and DON-3G were also the most frequently detected mycotoxins, with prevalence rates of 55.6% and 44.4%, respectively. However, in contrast to wheat and triticale, ZEN-14-sulfate was the third most commonly detected mycotoxin in barley. Analysis of maize samples revealed a higher susceptibility to fumonisin contamination, with fumonisin B1 and B2 being the most prevalent mycotoxins, detected in 85.1% and 34.3% of samples, respectively. These findings diverge from those reported by Birr et al. (2021), who observed DON and ZEN as the most prevalent mycotoxins in maize samples, each with a 100% incidence rate. Comparable results were reported by Khodaei et al. (2021), who noted high incidences of AFB1, ZEN, and DON in both maize and wheat samples. Such discrepancies may be attributed to differences in the geographical origin of the samples, as environmental and agronomic factors can influence the chemical composition of grains. This association between mycotoxin occurrence and grain chemical composition was similarly noted by Pokoo-Aikins et al. (2024), who reported that variations in corn composition may contribute to regional differences in mycotoxin profiles.

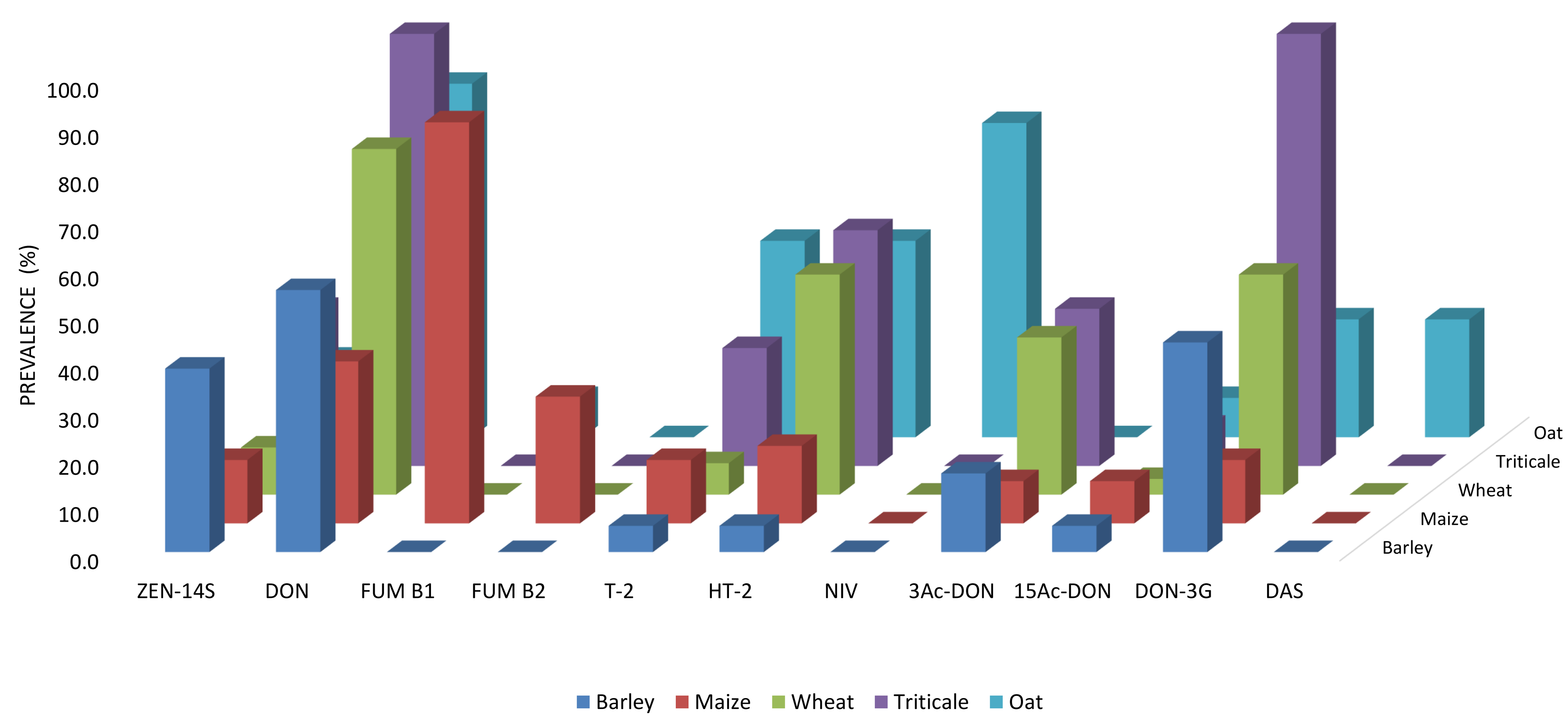

Figure 2. Prevalence of *Fusarium* mycotoxins and their metabolites in different cereals harvested in Croatia

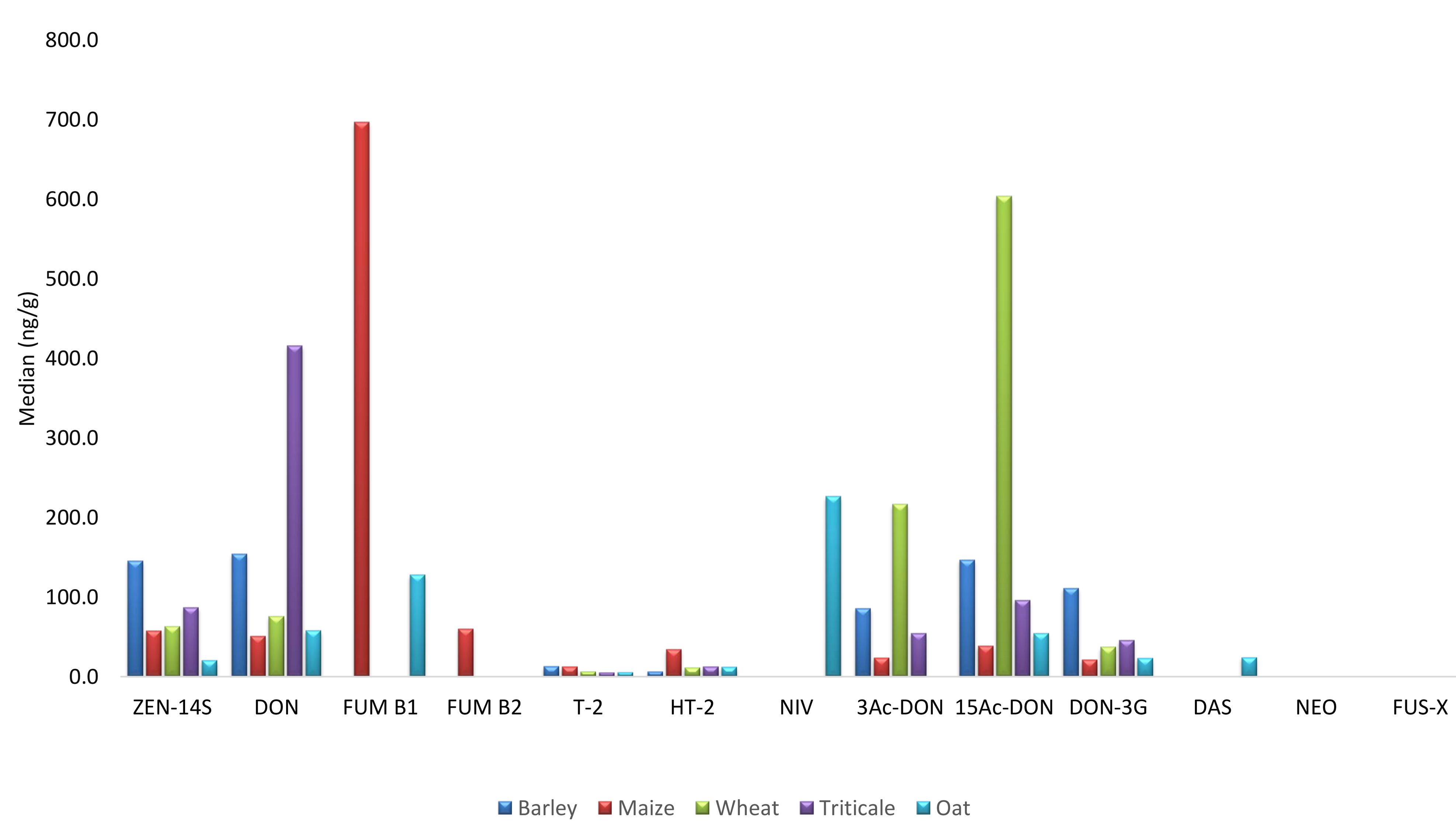

Figure 3. Concentration of *Fusarium* mycotoxins and their metabolites in different cereals harvested in Croatia

CONCLUSION

The contamination patterns of wheat, triticale, and barley, in regard to Further research is necessary to confirm these findings on a larger sample set. Future research should also focus on finding a correlation between the occurrence of mycotoxins and the type of grain in terms of chemical composition and also to connect with climate conditions regarding the geographical region.

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