Detection and Quantification of Pests in Corn Seeds Using X-Rays and Artificial Intelligence

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Abstract:

Corn (*Zea mays* L.) is one of the most important food crops for the production of cereals used for both animal and human consumption, being cultivated worldwide. Different pests can compromise the quality of stored seeds and grains, especially in tropical and subtropical regions, causing significant economic losses to the agricultural and food industries. Damage caused by feeding larvae, pupae, and adults can substantially reduce grain weight and quality during storage, facilitating the entry of pathogens and mites. Traditional methods for detecting pests in corn are time-consuming and difficult to handle. In this context, the development of advanced methods for early pest detection in grains and seeds is essential to expedite decision-making in the agricultural sector. To optimize this decision-making process, a software prototype was developed to assess pest infestation in corn seeds and grains using automated analysis of X-ray images. Six seed batches were separated with the following infestation percentages: 0%, 8%, 12%, 14%, 16%, and 20%, previously selected through X-ray analysis using the "Faxitron HP" equipment, model 43855A. After image capture, a software prototype was created using computer vision techniques and artificial intelligence training with Roboflow®. Tests were conducted with two repetitions of 100 seeds for each batch. The software demonstrated 96% accuracy in automatically identifying pest-infested seeds through X-ray images. Therefore, it is evident that the image analysis tool developed in this study has high applicability in the seed sector, providing greater precision and agility in evaluating infested seeds when performed on radiographed images.

Keywords:

Productivity, artificial intelligence, *Zea mays*.