

Letter to Editor

Honey proteins and seed dormancy

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In a recent issue of Pakistan Journal of Biochemistry and Molecular Biology, Azim et al [1] published an insightful article about the role of honey in triggering seed germination. Although honey contains only a small proportion of proteins (i.e. 1% or less), this study shows that honey proteins contribute toward different biological activities, one being its role in plant development. The use of honey proteins to break seed dormancy and serve as a bio-stimulant for plant growth is not extensively reported, in comparison to other plant stimulants viz. plant hormones, microbial inoculants, humid substances, seaweed extract, protein hydrolysate [2]. There are more information on seed germination and the use of well-researched and standardized bio-stimulants, such as gibberellic acid and potassium nitrate. Natural honey contains not only sugars, but also water, proteins, enzymes, amino acids, vitamins, minerals, and phenolic compounds.

An advantage of the reported study is that it confirms the concentration-dependent relationship between honey proteins and pea-seed germination. Azim et al (2024) reported that seed dormancy break occurred at a concentration of less than 1% honey protein, compared to the 3% and 6%, which stimulated seed dormancy conditions. A significant finding of their study was that glucose and sucrose, at the same concentration, promoted seed dormancy, highlighting that honey protein has a stimulatory effect on pea seeds. Furthermore, this reinforces that the carbohydrates content of honey plays an important role in seed

dormancy break. According to Finch-Savage and Leubner-Metzger [3], proteins and hormones are internal cues that regulate seed dormancy, while light, water, temperature, and chemicals play a role as external cues of this natural survival pathway. This indicates that honey protein may serve as external biochemical signals that aid seeds in dormancy break, i.e. in overcoming physiological dormancy by catalyzing proteins involved in early seed metabolism.

Since more is known about the constituents of honey and their individual effects on bees, humans, and plants, there was a need to evaluate honey proteins, and to ask questions about their identity, stability, and mechanism of action, more so because seed storage proteins, e.g. globulin, are required during early dormancy break [4], and the one question that arises is if the peptides (or amino acids) of honey could act as an independent biostimulant of seed germination. Similarly, Barac *et al.* [5] state that peas contain vicilins and legumes, another 2 storage proteins, which aid in fuelling seedling growth. It is possible, from this, that the combined effect of these pea proteins with honey proteins accelerate seed dormancy break, and thus seed germination. However, proteomic characterization of honey proteins are crucial to distinguish between honey-derived glycoproteins and the proteins characterized in royal jelly [5].

Currently, a lot of synthetic chemicals are used to promote early seed vigour in the agricultural sector, however, these are not

natural bio-stimulants, and therefore, the findings of Azim et al [1] have consequences not only for natural dormancy break, but also as an alternative to synthetic chemicals, thereby promoting eco-friendly and low-impact agricultural work. In order to commercialize honey proteins on a large scale to ensure reproducibility and economic viability, further studies on other crop plants is required, as well as, an evaluation of the environmental conditions and storage protocols used to treat these crop species are needed.

Irrespective of whether seed dormancy can break with lower concentrations of honey solution, or not, all seed types experience osmotic stress when they are subjected to water, and different solutions (viz. honey, smoke water, karrikins, aloe vera extracts, coconut water, etc). Azim et al [1] provides an intriguing display of preliminary evidence that shows the potential of honey proteins in triggering seed germination. However, for those findings to become agriculturally viable, molecular protein classification, field trials, and protein purification needs to be further explored. The findings of these authors highlight the robustness of indigenous natural resources, as well as the biochemical significance of honey to the agricultural sector in Pakistan and elsewhere.

References

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