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Evaluation of Cold Tolerance in Local Barley (***Hordeum vulgare*** **L.**) Genotypes and the Role of Salicylic Acid in their Resilience

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INTRODUCTION & AIM

Barley (***Hordeum vulgare*** **L.**) is a major cereal crop in Algeria's high plateau regions, essential for human and animal food security. However, its productivity is severely limited by low-temperature stress and recurrent frosts, leading to cellular damage, metabolic disturbances and significant yield losses [1]. Salicylic acid (SA), an essential plant signaling molecule, is known to enhance cold tolerance by regulating stress genes activating antioxidant defense systems and stabilizing cellular functions [2]. This study aims to assess the cold tolerance of local barley genotypes and the effect of SA on their resilience, seeking to identify the most performing genotypes for varietal improvement.

METHOD

This work, conducted at the Plant Ecophysiology Laboratory of Oran1 University, evaluated the response of three barley genotypes **Saida** (183), **Tihert** (ACSAD1704), and **Oued El Maleh** (ACSAD1737) to cold stress, with and without salicylic acid (SA). Seeds were surface-disinfected, placed in Petri dishes, and germinated in the dark at 4 °C, with daily watering of 4 ml of the specific solutions for 10 days (Table1). Morphological and physiological parameters were measured and statistically analyzed using Statistica software.

Table 1. Germination Conditions of Barley Genotypes

Treatment	Solution	Duration
Control (20 °C)	Distilled Water	10 days
	Distilled Water +0,5mM SA	
Cold Stress (4 °C)	Distilled Water	
	Distilled Water+0,5 mM SA	

RESULTS & DISCUSSION

This study revealed clear genetic diversity in genotype tolerance and physiological responses to cold stress. In the absence of SA, the **Tihert** genotype achieved a germination rate of 65%, compared with 20% for **Saida** and 5% for **Oued El Maleh**. The application of 0.5 mM SA markedly enhanced post-germination growth and resilience in the sensitive genotypes, increasing germination rates to 55% for **Saida** and 25% for **Oued El Maleh**, while its effect remained limited in Tihert, which already exhibited a high level of natural tolerance (Figure 1). Hierarchical clustering analysis based on Euclidean distances confirmed **Tihert** as the most cold-tolerant genotype (Figure 2).The observed improvement in the sensitive genotypes (**Saida** and **Oued El Maleh**) suggests that SA may activate antioxidant defense systems and membrane-stabilizing mechanisms, as reported by [3].

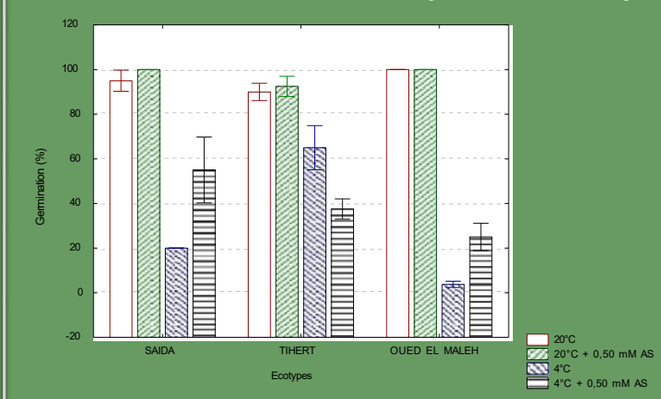

Figure 1 Germination Rate of Barley Genotypes under Cold Stress

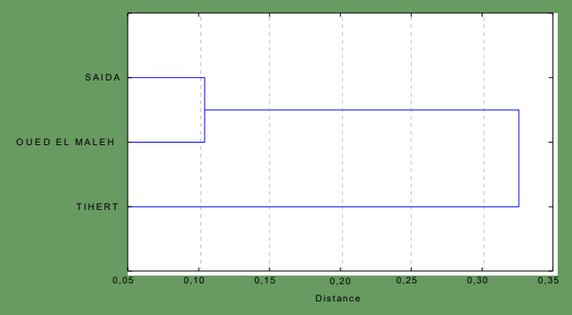

Figure 2 Hierarchical Classification of Barley Genotypes under Cold Stress

CONCLUSION

These results show that local genetic diversity and salicylic acid can enhance cold tolerance, with **Tihert** being a valuable genotype for barley breeding in Algeria.

FUTURE WORK / REFERENCES

Cross-tolerance transfers stress-resistance genes from robust genotypes to produce hardier, cold-tolerant barley.

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2 Mutlu S., **Karadağoğlu Ö.**, **Atıcı Ö.**, **Taşğın E.**, **Nalbantoğlu B.** « Time-dependent effect of salicylic acid on alleviating cold damage in two barley cultivars differing in cold tolerance. » Turkish Journal of Botany*, vol. 37, no. 2, 2013, pp. 343–349.

3 Mutlu, S., Atıcı, Ö., Nalbantoğlu, B., & Mete, E. (2016). *Exogenous salicylic acid alleviates cold damage by regulating antioxidative system in two barley (Hordeum vulgare L.) cultivars. Frontiers in Life Science*, **9**(2), 99–109. DOI : 10.1080/21553769.2015.1115430