

Factors Affecting the Germination and Emergence of Glyphosate-Resistant

Hybrid and Volunteer Corn (*Zea mays* L.)

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Introduction

- Volunteer corn is a problematic weed in corn and soybean
- It results either from the overwintering seeds of the corn hybrid used the previous year or from a failed corn stand in a corn replant situation (Steckel et al. 2009)



- It can reduce soybean yield up to 25% at volunteer corn density of 5,380 plants ha⁻¹ (Beckett and Stoller 1988)
- Volunteer corn seeds contaminate the harvested soybeans and reduce the market quality
- It also plays a role in survival and dispersal of corn rootworm and grey leaf spot disease
- A better understanding of volunteer corn germination under different environmental and stress conditions could aid management strategies

Objectives

- To evaluate the germination of glyphosate-resistant hybrid and volunteer corn in response to environmental factors such as temperature, light, osmotic stress, salt stress, and pH
- To evaluate the effect of agronomic factors like seed burial depth and flooding duration on the emergence of hybrid and volunteer corn

Materials and Methods

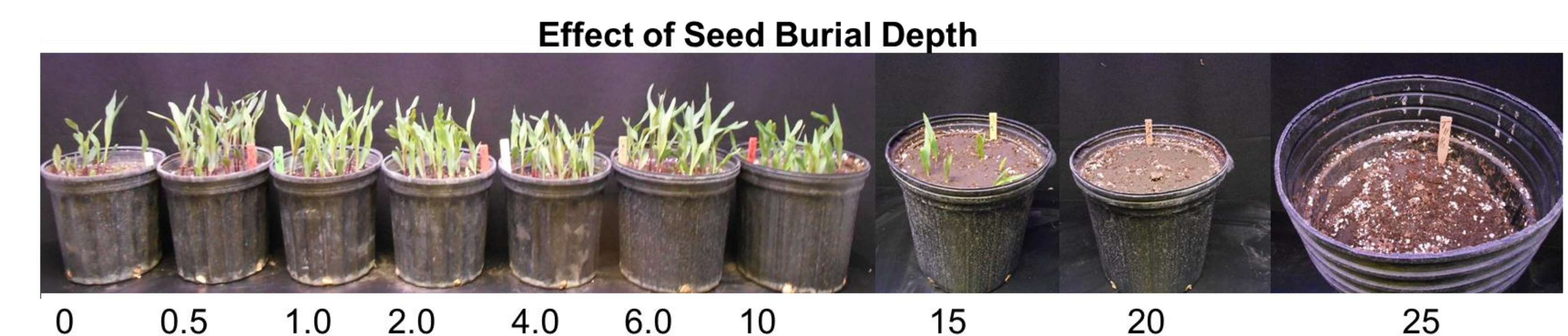
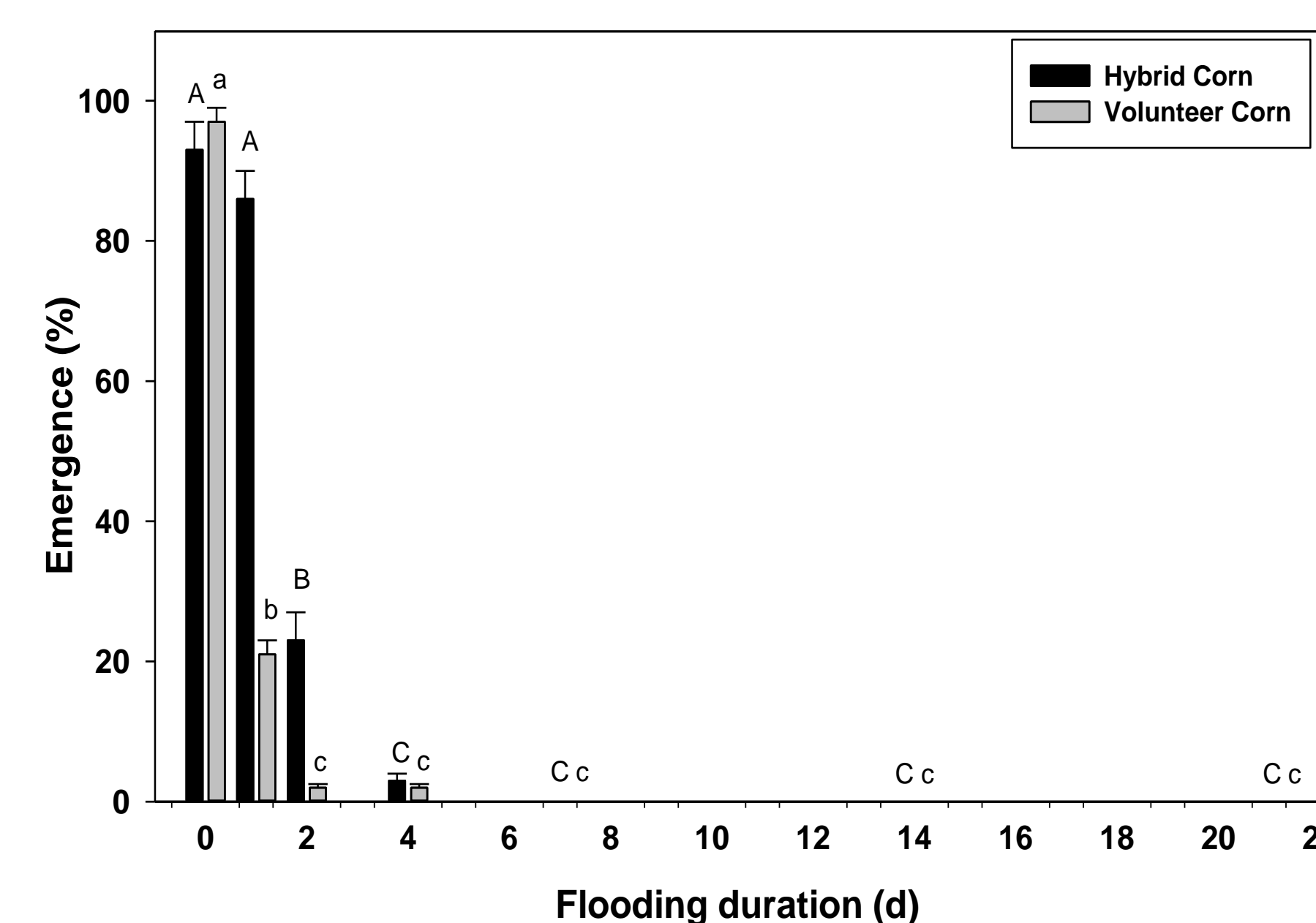
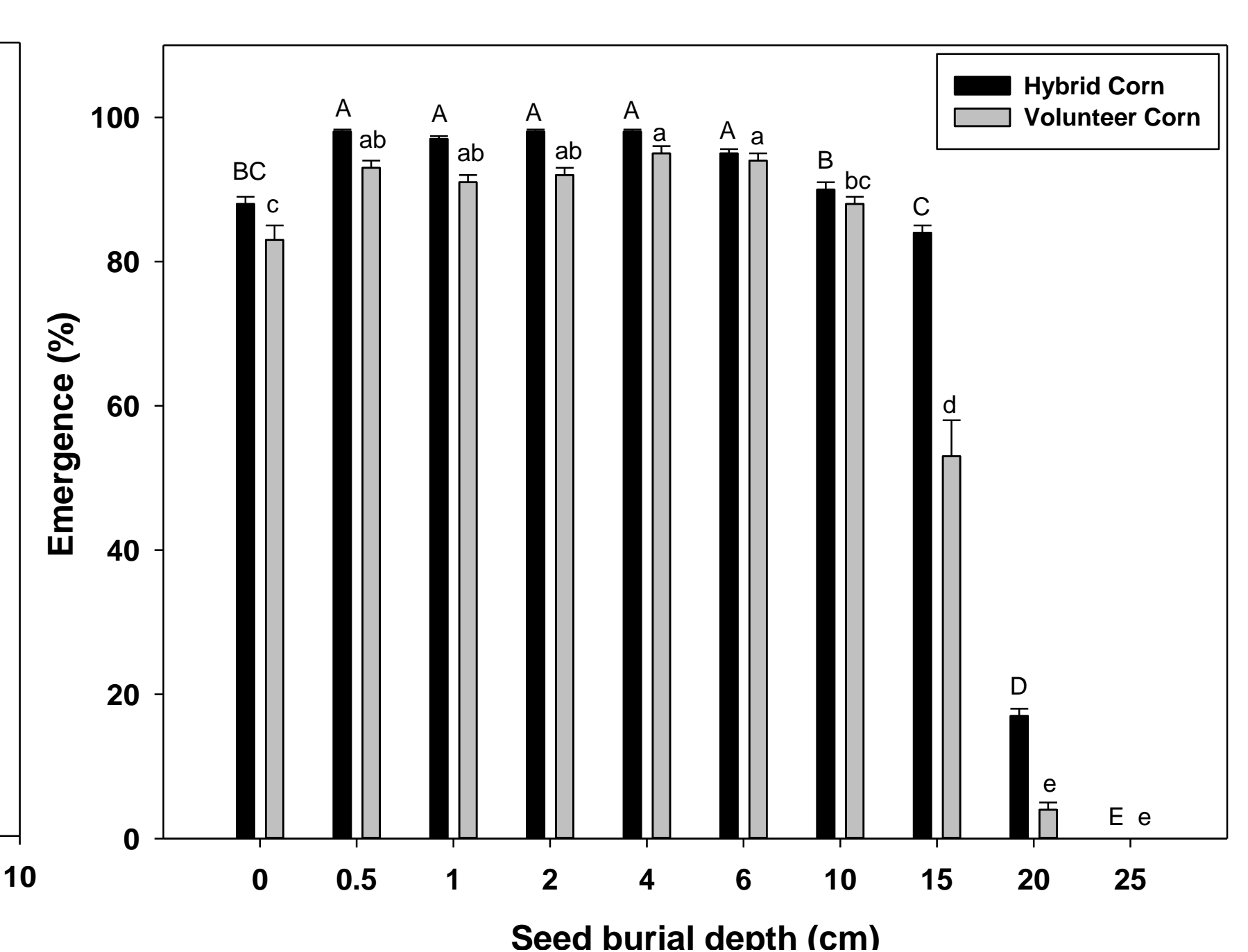
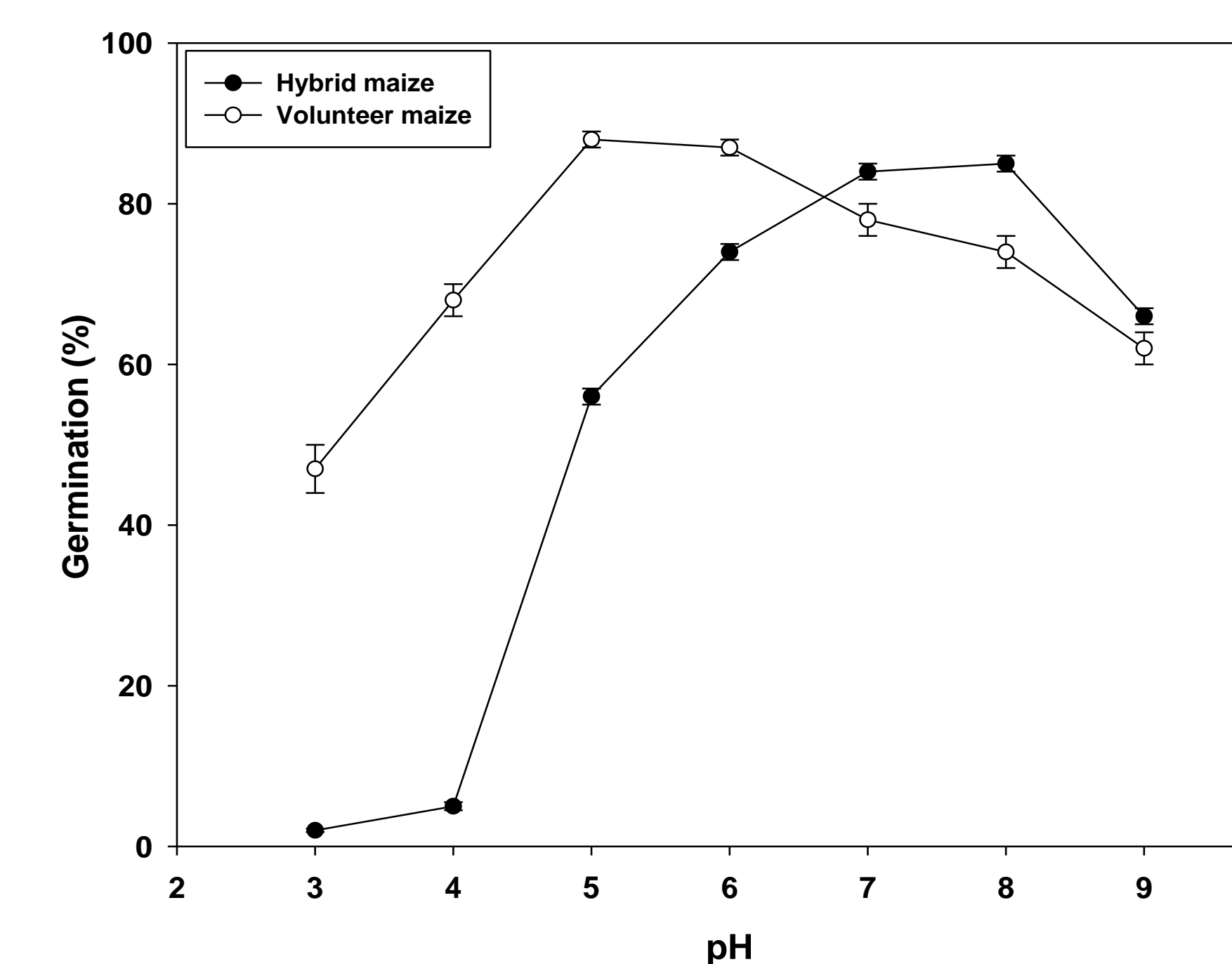
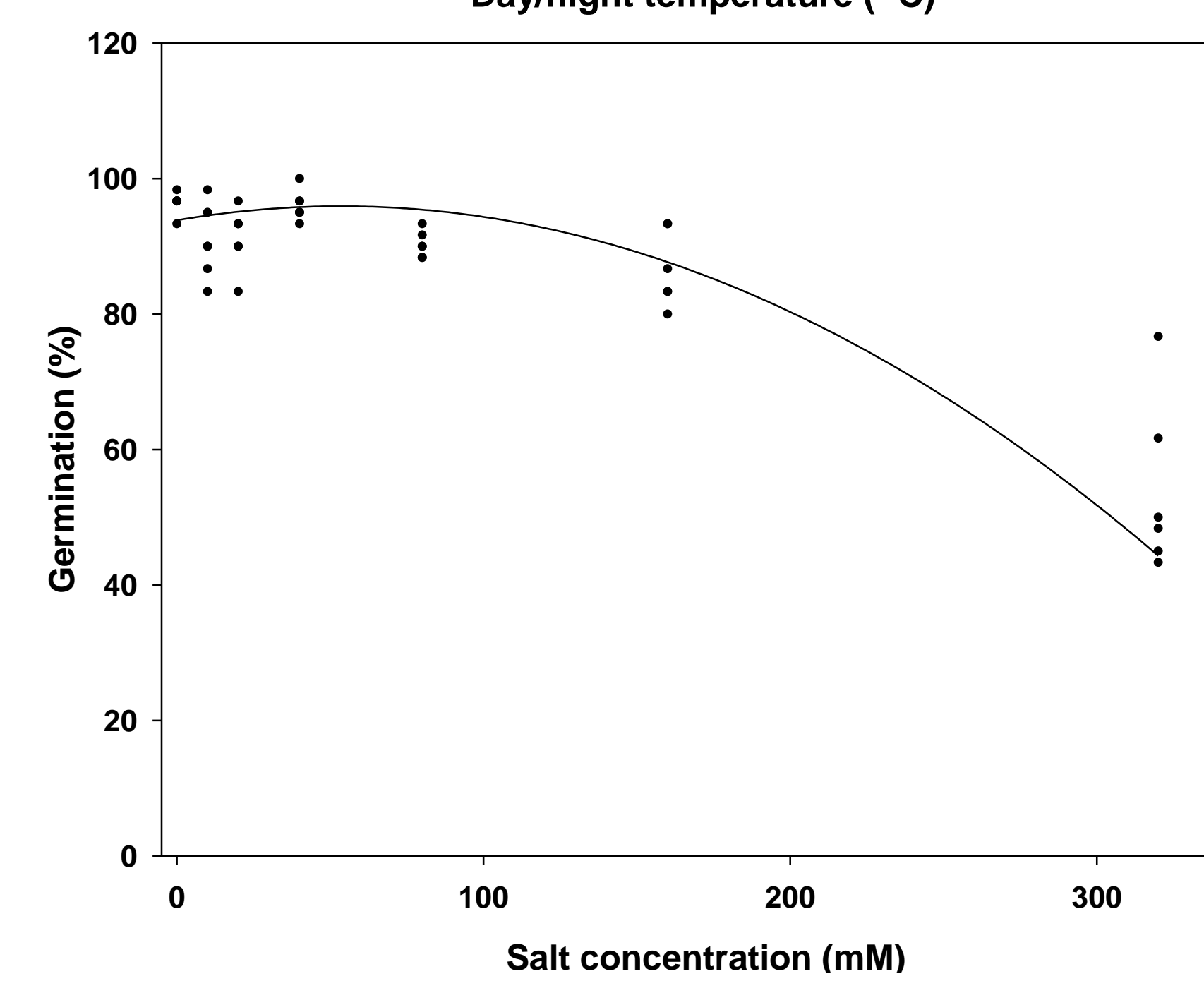
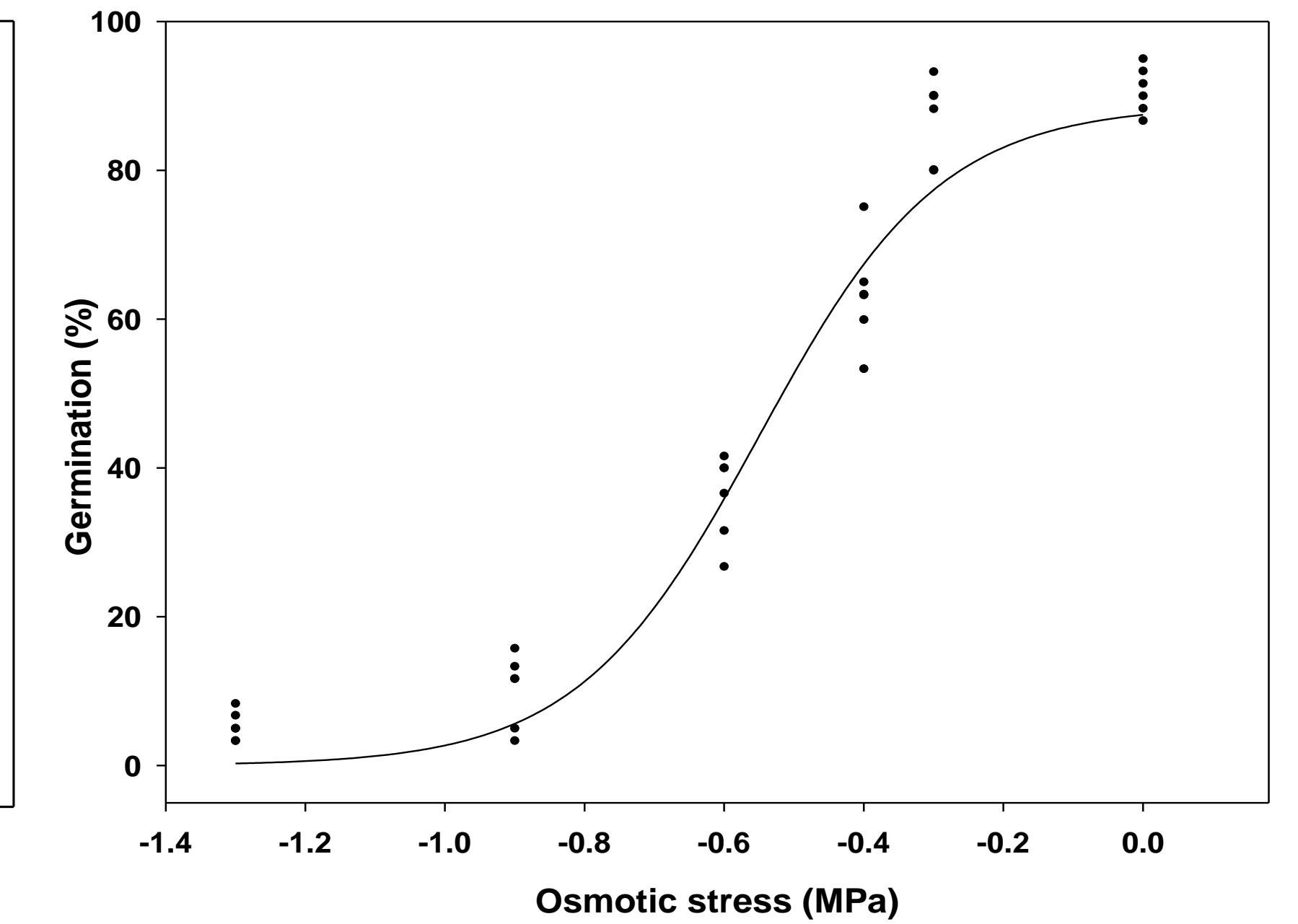
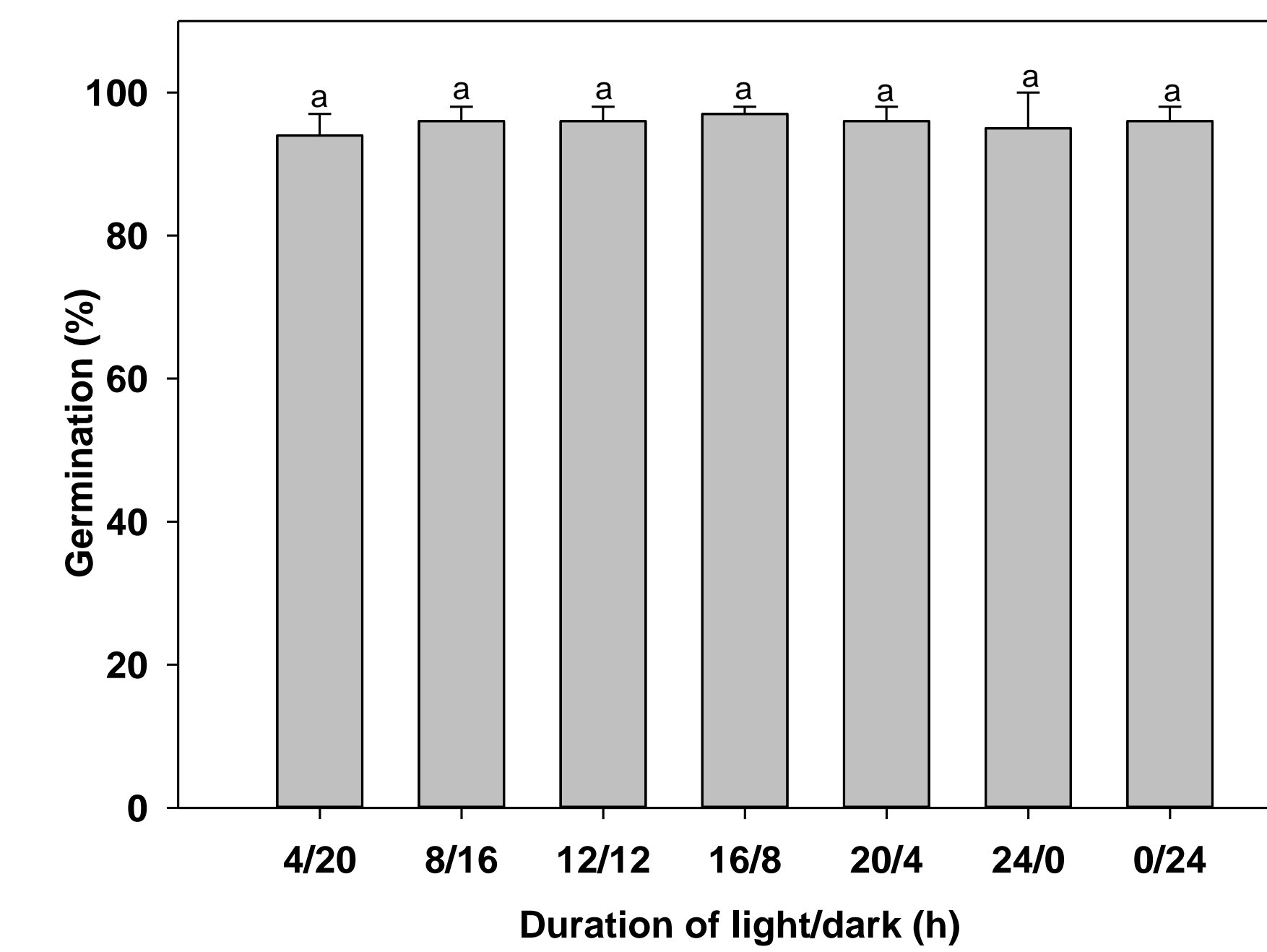
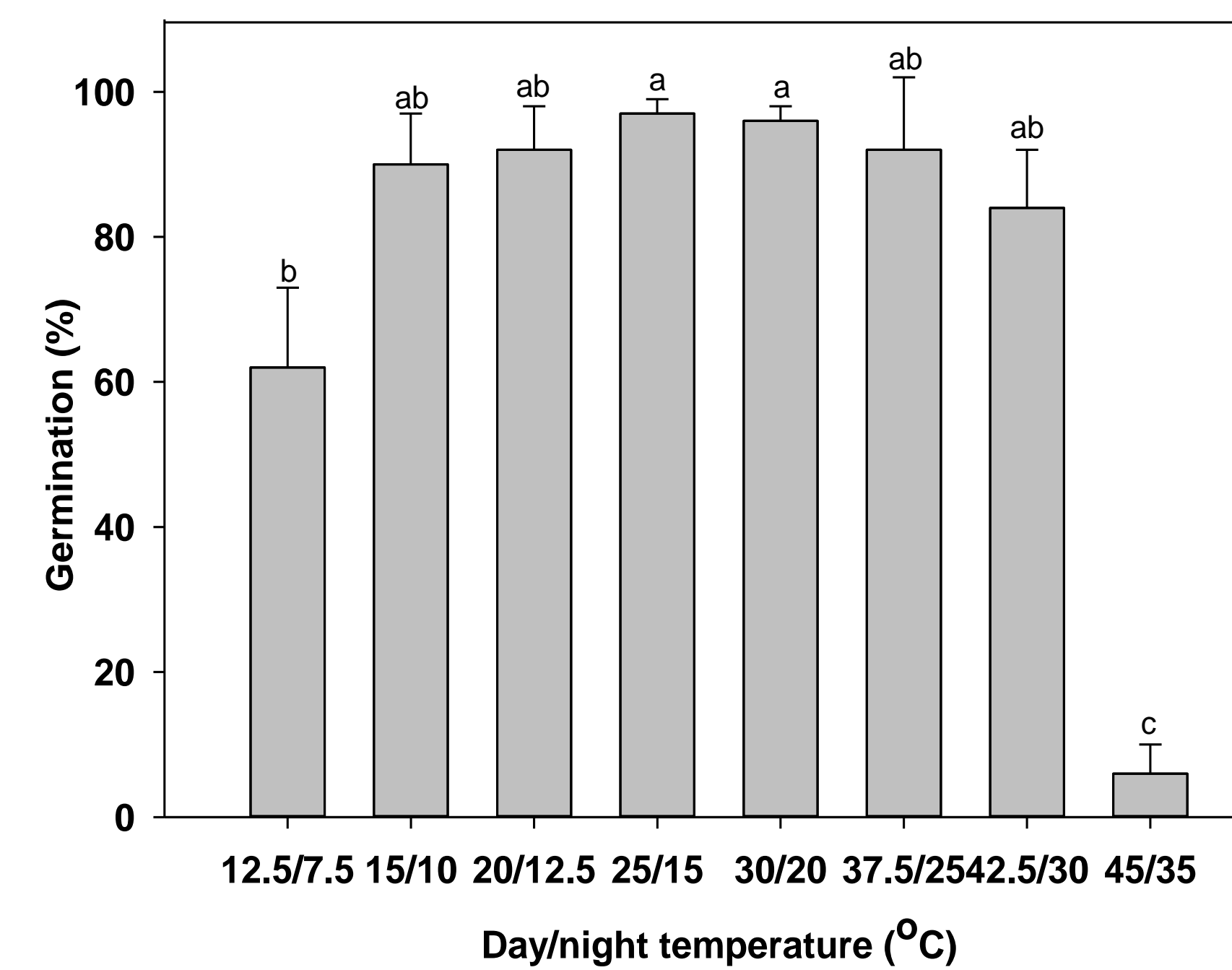
Environmental Factors:

- Growth chamber was used for this study
- Factorial randomized complete block design with six replications was used
- Fifteen sterilized seeds, each of hybrid and volunteer corn, were placed on a filter paper in separate 9-cm petri dishes
- 7.5 ml solution (depending on the factor) was used per petridish
- Germinated seedlings were counted after 7 days

Agronomic Factors:

- Studied under green house condition
- Factorial randomized complete block design with four replications was used
- In the seed burial depth study, hybrid and volunteer corn were planted at depths of 0, 0.5, 1, 2, 4, 6, 10, 15, 20, and 25 cm below the soil surface in plastic pots
- The emerged seedlings were counted every 7, 14, and 21 d after planting.
- In the depth of flooding study, water was maintained 2-cm above the soil surface for 0, 1, 2, 4, 7, 14, and 21 d to stimulate flooding
- The emerged seedlings were counted at 7, 14, 21, and 35 d after planting

Results



Conclusion

- 84 to 97% germination at 15/10 °C to 42.5/30 °C, while at higher temperature (45/35 °C) < 6% germination of both corn types was observed
- Alternating light and dark periods had no effect on germination of both corn types
- Germination of both corn types was < 65% at -0.4 to -1.3 MPa with optimum (> 90%) at 0 to -0.3 MPa
- > 90% germination of both corn types at 0 to 160 mM with the lowest (53%) at 320 mM was recorded
- Hybrid corn germination was favored by neutral to mild alkaline pH, while acidic pH favored volunteer corn germination
- Seedling emergence of hybrid and volunteer corn occurred at 0- to 15-cm depth, with optimum emergence at a depth of 0.5- to 6-cm
- 86 and 23% hybrid corn emergence at 1 and 2 days of flooding, while volunteer corn emergence was 21 and 2% at 1 and 2 days of flooding, respectively

References

- Beckett T. H. and E. W. Stoller. 1988. Volunteer corn (*Zea mays*) interference in soybeans (*Glycine max*). *Weed Sci.* 36:159-166
- Steckel L. E., M. A. Thompson, and R. M. Hayes. 2009. Herbicide options for controlling glyphosate-tolerant corn in a corn replant situation. *Weed Technol.* 23:243-246