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NOTE / NOTE

Seed germination and seedling vigor of weevil-damaged acorns of red oak

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Abstract: Acorn weevils (Coleoptera: Curculionidae) are well-known predators of oak acorns in the eastern hardwood forest region of the United States. We examined the germination percentage of seeds, as well as the physical characteristics of seedlings, originating from both weevil-damaged and sound acorns of red oak (*Quercus rubra* L.) to determine if weevil depredation impacts seedling vigor. Seeds were grown under greenhouse conditions for a period of 8 weeks. X-ray imaging was used as a nondestructive method for determining seed condition prior to germination. The combined data set showed a reduction in germination percentage from 86% for sound acorns to 26% for those damaged by weevils. Seven seedling metrics were evaluated for differences between seedlings originating from sound and those from weevil-damaged acorns. Of these metrics, the number of leaf flushes, total number of leaves, root collar diameter, shoot length, and dry mass were significantly ($P < 0.05$) different. Two variables, root length and shoot diameter, were not significantly different. Early allocation of resources to root establishment likely explains these findings. Because of reduced stem height and leaf number, seedlings from weevil-damaged acorns are likely to be less competitive in the forest understory than those from sound acorns.

Résumé : Les charançons des glands (Coleoptera : Curculionidae) sont des prédateurs bien connus des glands de chêne dans la région de la forêt feuillue de l'est des États-Unis. Nous avons étudié le pourcentage de germination des graines, ainsi que les caractéristiques physiques des semis, provenant de glands endommagés par les charançons et de glands sains de chêne rouge (*Quercus rubra* L.) pour déterminer si les ravages causés par les charançons ont un impact sur la vigueur des semis. Les graines ont été cultivées en serre pendant une période de huit semaines. L'imagerie par rayons X a été utilisée comme méthode non destructive pour déterminer l'état des graines avant la germination. Le jeu des données combinées a montré que le pourcentage de germination diminuait de 86 % dans le cas des glands sains à 26 % dans le cas des glands endommagés par les charançons. Sept métriques des semis ont été évaluées pour comparer les semis provenant de glands sains et les semis provenant de glands endommagés par les charançons. Parmi ces métriques, le nombre de pousses foliaires, le nombre total de feuilles, le diamètre au collet, la longueur de la tige et le poids sec étaient significativement ($P < 0,05$) différents. Deux variables : la longueur des racines et le diamètre de la tige, n'étaient pas significativement différentes. L'allocation précoce de ressources à l'établissement des racines explique probablement ces résultats. À cause de la hauteur réduite de la tige et du plus petit nombre de feuilles, les semis provenant de glands endommagés par les charançons ont des chances d'être moins compétitifs dans le sous-bois des forêts que les semis provenant de glands sains.

[Traduit par la Rédaction]

Introduction

Oaks (*Quercus* spp.) constitute a major component of the tree canopy throughout the eastern hardwood forest region and are often regarded as a keystone group. However, over the last three decades, numerous authors have commented on a widespread decline in natural oak regeneration (McCarthy et al. 1987; Crow 1988; Lorimer 1993), as is evidenced by a lack of oak saplings in the forest understory. Barring large-scale system-level changes (e.g., disturbance, climate), this trend will likely result in a shift in forest composition as the canopy-dominant oaks are replaced by more mesic species, and this in turn may have cascading ecological consequences.

Seed predators, including insects, often play a role in the reduced regenerative ability of oaks (Galford et al. 1991; Sun et al. 2004). Acorns are a major food source for insects, such as the stony gall wasp (*Callirhytis fructuosa* Weld.), acorn moth (*Valentinia glanduella* Riley), and acorn weevils (Coleoptera: Curculionidae). Of particular concern are the acorn weevils, which are considered one of the top insect acorn consumers in eastern forests. Lombardo and McCarthy (2008) found weevil predation rates in two managed oak forests in southeastern Ohio to vary between 26% during a mast year and 86% during a non-mast year for chestnut oak

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