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研究论文

啮齿动物对锐齿槲栎坚果的取食模式及坚果命运

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摘要 啮齿动物对栎属坚果的捕食和传播是栎林能否进行实生苗成功进行更新的关键因子。2002～2003年，通过对锐齿槲栎（*Quercus aliena* var. *acuteserrata*）坚果进行烧焦炭化、2种胶带包裹、系绳、染色、埋藏、放置背景颜色的4种改变、切半和对照12种处理，观测坚果的留存与啮齿动物就地捕食和搬运等作用下的变化动态及其最终数量或比例，以研究啮齿动物对坚果的捕食、搬运、丢弃、埋藏等作用以及最终留存的数量与特点，测定完好坚果的比例在啮齿动物捕食前和捕食后的变化，结果发现：(1) 丢弃坚果中非完好的比例较捕食前有显著的增加 ($p>0.05$)，表明啮齿动物咬开坚果后才能识别坚果是否完好并进一步确定是否继续捕食。(2) 与对照比较，坚果的命运可分为 4 类：① 简单埋藏、放置黑色纸上的坚果命运没有显著改变，说明啮齿动物对坚果周围环境简单变化的敏感性低，且更加适应黑色背景。② 系绳、染色、切半、以白、绿、红纸为背景放置坚果的处理，就地捕食的速率显著降低，持续时间不变；与对照相比，搬运的速率早期相同，后来略有升高，搬运持续时间也相应增加，最终被搬运的比例增加而就地捕食的比例降低，留存的坚果为0。说明坚果的附着物、颜色、完整程度、放置背景等改变后，有助于提高啮齿动物对捕食风险的估计，并相应采取减少就地捕食的策略。③ 烧焦坚果就地捕食和搬运的开始速率接近0，至第4～5天，速率提高至最大值，然后再降低至0，结果就地捕食和搬运的比例都明显的下降，留存的坚果比例为49.6%，其中就地捕食的比例相对于搬运的比例明显减低，说明啮齿动物对坚果气味的变化同样采取减少就地捕食的策略，从而增加了留存；而搬运速率由开始时极低逐渐升高的现象，表明啮齿动物对于食物气味的变化可能采取试探的策略，经过试探再加快搬运速率。④ 胶带包裹处理的坚果，啮齿动物就地捕食的开始速率接近0，在第4天上升为最大值，随后开始下降，结果坚果留存为0，就地捕食的比例低于5%，搬运的比例增加。啮齿动物对坚果气味和状态共同的变化同样采取减少就地捕食的策略，而对搬运同样采取试探的策略，说明啮齿动物对坚果的感知可能属于视觉和嗅觉混合作用的模式。

关键词 锐齿槲栎；啮齿动物；坚果；取食策略；感知；视觉

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The predating behavior of rodents and its effects to acorns of *Quercus aliena* var. *acuteserrata*

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Abstract

he effects of rodents to forest dynamics are highlighted in many ecological researches. In 2002 and 2003, a series of experiments were conducted to investigate the predating behavior of rodents to acorns of Quercus aliena var. acuteserrata under 12 different treatments respectively: burnt fully, enwrapped in plastic tapes, dyed with black carbon ink, buried in soil surface, set on different colors of papers, attached with strings, cut into halves and in control. The count numbers of acorns that were left intact, predated in situ or removed away were examined and documented in detail, as well as the ratios of acorns with infestation before predation and after. It was found that: (1) the ratios of acorns with infestation before predation and after were significantly different ($p>0.05$), suggesting that rodents could detect the infestation of acorns. (2) the effects of rodents predation to acorns could be classified into 4 classes: ① acorns that were simply buried, or set on black paper were not distinguishable from the control, suggesting that rodents don't respond to the small changes of odor concentration resulted from burying and might be more adapted to the black o

ther than else background. ② Acorns attached with strings, dyed with black ink, cut into halves o r set on white/green/red papers were predated in situ with decreased rate and removed away wit h the same rate in the first day of observation when compared with those of the control, but the re moval lasted longer time. The final ratio of removal was increased, and that of predation in situ wa s decreased, and none was left intact. This might suggest that rodents have higher predating risk e xpectation to acorns under the change of their status, colors, completeness or background, and a dopted a kind of “less predation in situ" strategy. ③ Acorns burnt fully were neither predated in si tu nor removed in the first day, but both rates were increased to the peak in the forth or fifth da y, and then begun to decline. Consequently, the final ratio of predation in situ and removal decrea sed greatly with 50% acorns left intact. This suggests that rodents use the “less predation" or “les s activities" strategy to respond to substantial change of acorn odor concentration, and, as a resul t, much more acorns were remained intact. ④ Acorns enwrapped were rarely predated in situ, b ut the removal remained unchanged at the beginning, then reduced to near zero in the second da y, and kept increasing after that until reaching the peak at the fourth day; the final ratio of predatio n in situ was lower than 5% with none left intact, and therefore, the removal was greatly increase d. It is supposed that rodents take the “less predation in situ" strategy under the condition of subst antial change in both odor and states of acorns, since the dual change might indicates higher preda tion risk and causes rodents to predate less in situ. As is proved here that the detection to the pre dation risk was critical to rodents’ behavior, it is reasonable to suppose that the eyes of rodents c ould play a much more important role in rodents’ predating behavior than previously expected.

Key words sharptooth oak (Quercus aliena var. acuteserrata) _ rodents _ acorns _ predation strategy _ sight _ detect.

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