

BUD GALL MIDGES – POTENTIAL INVADERS ON LARCHES IN NORTH AMERICA

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ABSTRACT

Larch bud gall midges (Diptera: Cecidomyiidae) form a specialized group of gall insects inhabiting buds of larch (*Larix*) in the northern Palaearctic Region. Currently there are four described species in this group. *Dasineura kellneri* Henschel is found in Central Europe and infests *Larix decidua*; *D. rozhkovi* Mam. et Nik. is widely distributed through southern and eastern Siberia to Khabarovsk and in northeastern Mongolia on *L. sibirica*, *L. gmelinii*, and *L. czekanowskii*; *D. verae* Skuhrava is known from Southern Siberia and Northern Mongolia on *L. sibirica*, *L. gmelinii*; *D. nipponica* Inouye was described from Japan and lives on *L. kaempferi*.

Species of midges differ both in morphology of adults and in gall structure. In general, all midges modify larch buds into an artichoke-like galls in the center of needle clusters. Gall-bearing buds die. During persistent and heavy infestations trees may lose up to 90 percent of their buds. Such trees produce no flower buds, so commercial seed production is impossible. Nowadays, the midge *D. rozhkovi* is the primary biological factor affecting productivity of larch seed orchards in Russia. Even though badly infested, trees do not die because new twigs are formed annually on gall-bearing branches.

All larch gall midges are highly specialized herbivores with a 1-year life cycle. The flight period of adult midges is synchronized with the initiation of larch needle growth in early spring and the flight period is very short: 3-4 days with nearly 60 percent of adults hatching in one day. Fecundity is rather constant, at 60-85 eggs per female.

Females oviposit between the needles and bract scales of spur shoots. Larvae hatch in 6-9 days and

crawl between the needles to the vegetative cone of the next year's bud, which is situated in the center of the needle cluster. Substances secreted by the larvae modify the buds' morphogenesis: the folia primordia start growing and produce scales instead of needles. The galls become visible in early June and stop growth in 1-2 months. The base of the galled bud increases and the scales closing it, form a larval chamber, in which the insect develops.

Larvae feed at the bud apex by sucking food substances from plant tissues. In August the fourth instar larvae weave a thick white cocoon for overwintering. *D. kellneri* and *D. nipponica* make a cocoon in the larval chamber; *D. rozhkovi* leaves the chamber and overwinters between external gall scales; finally, larvae of *D. verae* leave the tree and overwinter in forest litter. Larvae of all species pupate the following spring in the cocoon; in 5-7 days the new adults emerge.

The adaptive potential of the most damaging species—*D. rozhkovi*—was studied at the graft plantation of larches in Krasnoyarsk Kray. In fewer than 17 generations the gall midge population inhabiting *L. sibirica* in the vicinity, colonized the crowns of *L. gmelinii*, *L. ochotensis*, *L. sukachevii*, *L. decidua* and (important!) *L. laricina*. All larch species differ in time of bud burst and in a short period of time the dynamics of adult midge emergence in gall insect demes was observed to differ between host tree species according to their phenology.

Currently there are no insect herbivores inhabiting the buds of larches in Northern America. Random introductions of Palaearctic species of gall midges, especially the most aggressive *D. rozhkovi* could quickly occupy this empty ecological space.