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"Solidarity in a competing world — fair use of resources"

Bee Pollination Increases Yield and Quality of Cash Crops in Burkina Faso, West Africa

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Abstract

Insect pollination constitutes an ecosystem service of global importance, providing significant economic benefits to human society alongside vital ecological processes in terrestrial ecosystems. A growing human population especially in developing countries induce a rising demand for food and income security under rapidly changing environments. Seventy-five per cent of all agricultural crop species rely, to some degree, on animal pollination. Bees are the most important pollinators worldwide; a complete loss of their pollination service could reduce crop yields by ca. 40 %. The study aimed to investigate the contribution of pollination by bees for yield and quality in cotton and sesame. Field research was carried out in 2015 in south-west Burkina Faso. Pollination experiments were conducted to determine the rate of self-compatibility. On 11 fields for each crop pollinator exclosure and outcrossing experiments were conducted on 50 flowers per field. Efficiency of various bee pollinator species for fruit set and quality was investigated. Germination experiments with seeds resulting from self or outcross pollination were conducted to test for seed quality in terms of inbreeding depression. Honey bees and one wild bee species were the most effective pollinators. The exclusion of bees led to a reduction in fruit set of ca. 11 % in cotton and ca. 26 % in sesame. Pollinators significantly increased the number of intact seeds and seed mass in both species. Bees increased the economically most important fibre mass of cotton by ca.62 % in comparison to flowers where pollinators were excluded. In sesame fruit weight was enhanced by ca. 63 % when pollinated by bees. The germination rate of seeds resulting from self-pollination decreased significantly in both species, which is a clear sign of inbreeding depression and economical important, since the seeds are used for the next sowing season. The gratis pollination service by bees was thus beneficial, contributing to cotton and sesame production by enhancing the quantity and quality of these major cash crops in Burkina Faso.

Keywords: Bees, Burkina Faso, cotton, pollination, quality, sesame

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