World nourishment at risk of being diminished: Wild cereals threatened by global warming

February 23 2012

A 28-year comparative study of wild emmer wheat and wild barley populations has revealed that these progenitors of cultivated wheat and barley, which are the best hope for crop improvement, have undergone changes over this period of global warming. The changes present a real concern for their being a continued source of crop improvement.

Wheats and barleys are the staple food for humans and animal feed around the world, and their wild progenitors have undergone genetic changes over the last 28 years that imply a risk for crop improvement and food production, reveals a new study. "The earliness in flowering time and genetic changes that are taking place in these important progenitor wild cereals, most likely due to global warming, can negatively affect the wild progenitors. These changes could thereby indirectly deteriorate food production," says Prof. Eviatar Nevo of the Insitute of Evolution at the University of Haifa who directed the study.

Wheats are the universal cereals of Old World agriculture.The progenitors, wild emmer wheat and wild barley, which originated in the Near East, provide the genetic basis for ameliorating wheat and barley cultivars, which as earlier studies have shown, are themselves under constant genetic erosion and increasing susceptibility to environmental stresses.

The new study set out to examine whether the wild cereal progenitors are

undergoing evolutionary changes due to climate change that would impact future food production. It was was headed by Prof. Nevo, along with Dr. Yong-Bi Fu from Canada, and Drs.Beiles, Pavlicek and Tavasi, and Miss Khalifa from the University of Haifa's Institute of Evolution, and recently published in the prestigious scientific journal Proceedings of the National Academy of Sciences (*PNAS*).

Ten wild emmer wheat and ten wild barley populations from different climates and habitats across Israel were sampled first in 1980 and then again at the same sites in 2008 and grown in a common greenhouse. The results indicated that over the relatively short period of 28 years, all 20 wild cereal populations examined, without exception, showed a dramatic change in flowering time. All populations sampled in 2008 flowered, on average, about 10 days earlier than those sampled in 1980. "These cereal progenitors are adapting their time of flowering to escape the heat," Prof. Nevo explains. The study also found that the genetic diversity of the 2008 sample is for the most part significantly reduced, but some new drought-adapted variants appeared that could be used for crop improvement. "The ongoing global warming in Israel is the only likely factor that could have caused earliness in flowering and genetic turnover across the range of wild cereals in Israel. This indicates that they are under environmental stress which may erode their future survival," says Prof. Nevo. "Multiple effects of the global warming phenomenon have been observed in many species of plants and animals," he adds. "But this study is pioneering in showing its infuence on flowering and genetic changes in wild cereals. These changes threaten the best genetic resource for crop improvement and thereby may damage food production."

A number of species did show positive adaptive changes resulting from global warming, such as earliness in flowering or migration into cooler regions. "But overall," says Prof. Nevo, "the genetic resources of these critical wild cereals are undergoing rapid erosion - and cannot be dismissed as a concern for future generations. Wild emmer wheat is the

world's most important genetic resource for wheat improvement, and it is up to us to preserve it. We are utilizing our gene bank at the Institute of Evolution for transforming genes of interest to the crop. However, a much more extensive effort needs to be made to keep the natural populations thriving, by preventing urbanization and global warming from eliminating them".

Provided by University of Haifa

Citation: World nourishment at risk of being diminished: Wild cereals threatened by global warming (2012, February 23) retrieved 18 September 2024 from https://phys.org/news/2012-02-world-nourishment-diminished-wild-cereals.html

This document is subject to copyright. Apart from any fair dealing for the purpose of private study or research, no part may be reproduced without the written permission. The content is provided for information purposes only.