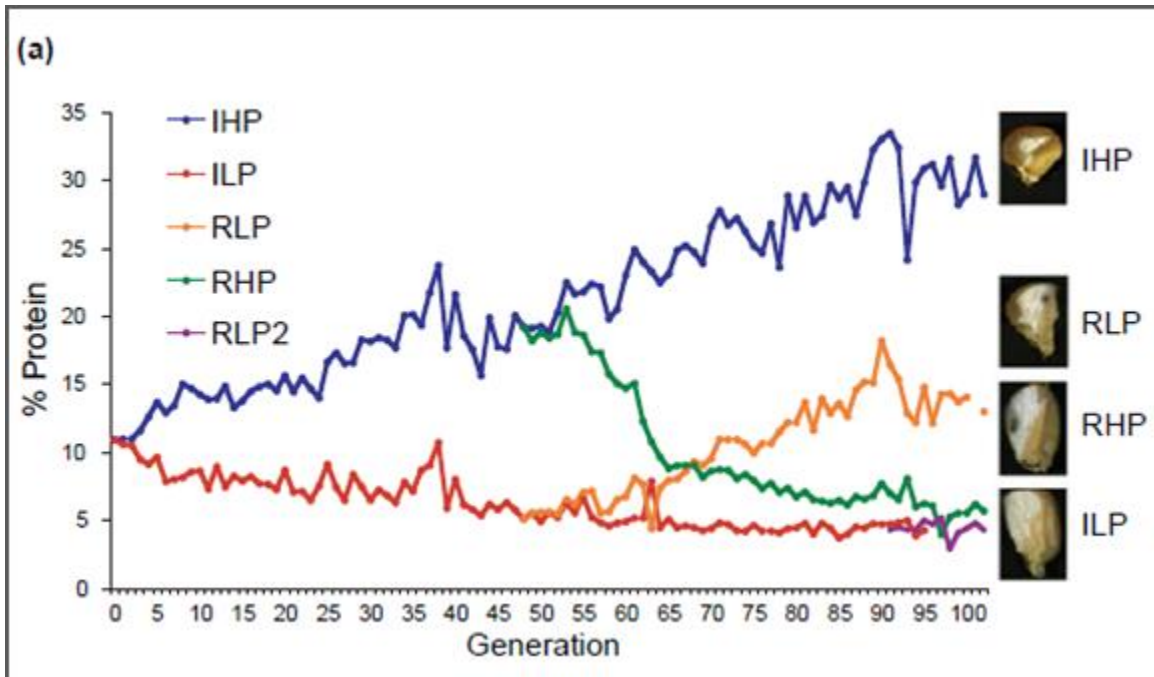




Selective Breeding in Maize



Caption: The graph shows the effect of artificial selection on the protein content of maize kernels. Starting at generation 0, plants were selected for either high or low protein content to produce two strains: Illinois High Protein (IHP, shown in blue) and Illinois Low Protein (ILP, shown in red). At generation 48, researchers reversed the selection on some of the IHP and ILP plants, leading to two new strains: Reverse High Protein (RHP in green) and Reverse Low Protein (RLP in orange). At 90 generations, selection on some of the ILP plants was again reversed to produce a fifth strain, RLP2, shown in purple. Cross sections of the kernels of four of the strains are shown on the right side.

BACKGROUND INFORMATION

In 1896, researchers in Illinois began an experiment to study whether they could increase the protein concentration of maize (corn) by selective breeding. Each year, researchers planted seeds from the most protein-rich and protein-deficient plants from the previous generation. Running for over 100 generations, this is now the longest-running controlled artificial selection experiment in the world. From a single strain of corn, the selection process resulted in two new strains: one with increased protein, called Illinois High Protein (IHP), and one with decreased protein, called Illinois Low Protein (ILP). After 48 generations, researchers then reversed the selection pressures on some of the IHP and ILP plants. They planted the seeds from the most protein-deficient IHP plants and the most protein-rich ILP plants to produce reverse high protein (RHP) and reverse low protein (RLP) plants, respectively. As a result, after 48 generations from the start of the experiment there were four strains of maize plants: IHP, ILP, RHP, and RLP. After 90 generations from the start of the experiment, researchers reversed the selection pressure on the ILP strain a second time to produce a fifth strain: RLP2 plants. Cross-sections of mature kernels from generation 100 show the phenotypic differences among the different strains. In addition to the impacts on nutrition and quality of the corn grain, the selection for grain protein changed other traits such as grain yield and nutrient uptake. The results of the study, as summarized by Moose, Dudley, and Rocheford, are shown in the graph above.