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Doing it like mother Nature

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Scientists are using the methods of nature herself to modify the DNA of the wheat plant. Large scale and protected cultivation of wheat, and the peculiar form of its DNA has led to difficulties in using the normal methods to develop special strains of wheat. But taking a look at how wheat developed in the first place has shown a way.

Reproduction and genetics

The way complex living things reproduce is with the 'double helix' of the DNA in cells splitting into 'single strands. One strand from one parent combines with one strand from the other parent, to produce a new, child DNA. The child thus has a full set of DNA that expresses features of both parents.

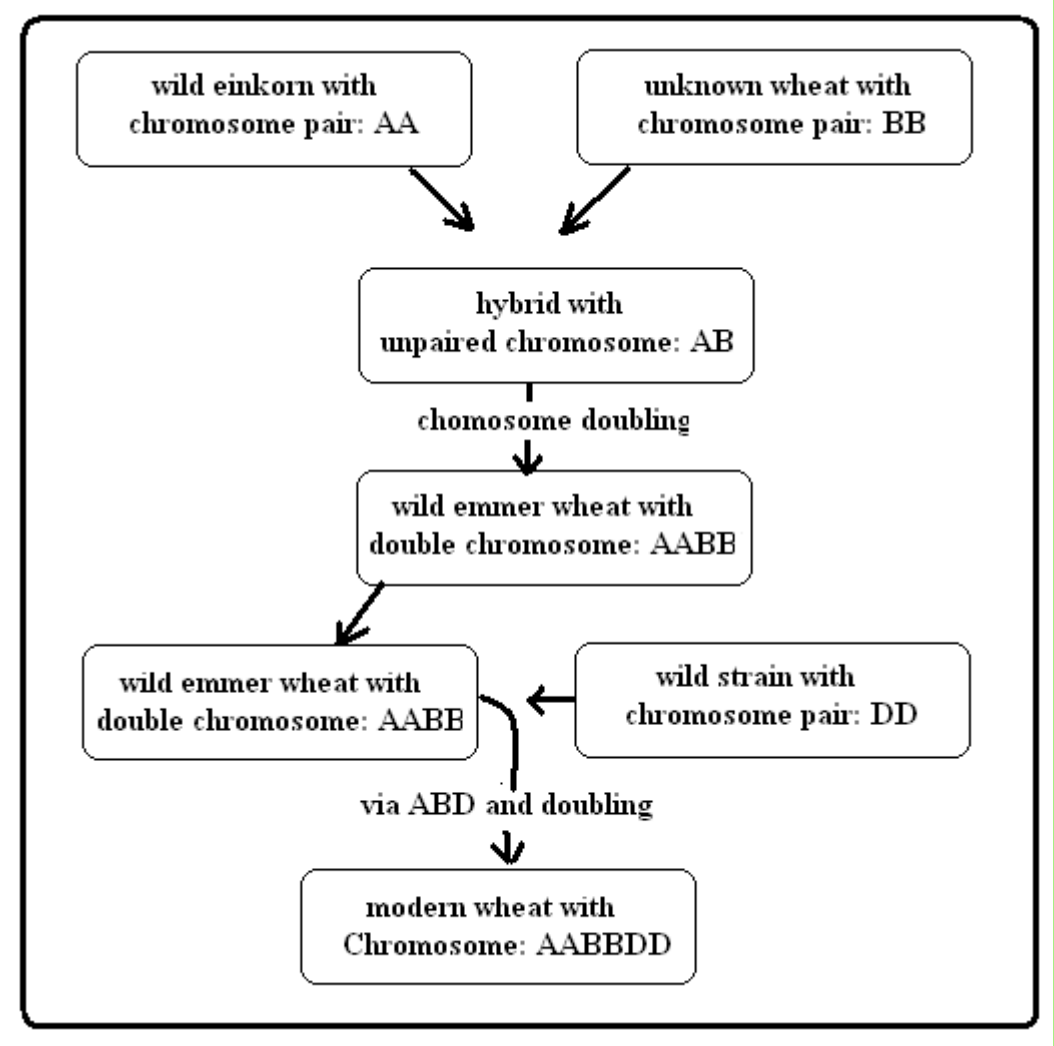
This is also the reason that there cannot be a viable offspring of parents of different species – the 'single strands' are not able to pair up! But once in a (very rare) way, one or both single strands may be 'deviant', leading to a complete DNA – but the result rarely survives and if it does, does not develop normally

With related species, like the horse and the donkey, an offspring, the mule, does get born, despite the mis-match and it has some of its parents' qualities, but it is sterile. Sometimes, due to accidents in the process of reproduction, a child of a normal union may be born with an extra chromosome. This happens in the ***Down syndrome***, in humans, where chromosome 21 is repeated and the deviation leads to several abnormalities (one being enhanced musical ability!)

Double whammy

The reason that mismatched pairs are sterile is that they cannot divide into matching 'single strands'. But, again, very rarely, the DNA strands of a species otherwise sterile can get *doubled*. When this happens, the double strand can split into two matching halves and the strain can reproduce.

This is what is believed to have happened, twice in history, with the ancestors of modern wheat. An ancient *einkorn* species combined with a wild grass to give a sterile, hybrid form. By chance 'doubling', this form got transformed and became the *emmer* wheat. Again, combination with a wild grass led to another sterile form, which again changed by 'doubling', to result in modern wheat.



Weak by breeding

Modern wheat was a runaway success and became the staple of the human race for millennia. The price of such exclusive and uniform farming was that the species did not develop genetic diversity. Different strains to combine, in breeding, to develop special purpose strains, which can resist droughts or attack by pests, are thus not available to breeders. A method used, where breeding cannot lead to the results desired, is to create mutations by radiation and create the genetically modified or 'GM' varieties. But because of the complex, 'doubled' nature of the wheat chromosome, the GM revolution did not help wheat as much as it did rice and maize.

Nature's method

Now, scientists at the International Centre for Improvement of Wheat and Maize Varieties, in Mexico have used nature's own method to bring different genes into the pool. Wheat plants were crossed with wild grass strains to create a hybrid. The hybrid contained the valuable features of the wild grass, but was sterile. To mimic what

happened by chance ages back, chemicals were used to induce ‘doubling’, in the laboratory, to make the strains fertile. Normal breeding methods could then be used to create strains that have the useful genes, which have actually come in from a different species.

One of the strains produced shows marked resistance to drought conditions and has about 40% greater yield in dry conditions than traditional wheat plants.