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Heredity and Its Application

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ABSTRACT

Heredity is a science that has been used since prehistoric times. As a result of the passage of time, the wild forms of plants turned into fruitful generations. Although in the distant past, breeding was done in a traditional manner in order to gain more profit, today, with the development of modern technology, inheritance has reached its highest level of development. The developments that have taken place in the plant sector apply to the same extent and maybe even more in the animal sector and in various economic and food fields. The most common methods that are used in order to improve the generation of plants and animals are: inserting an alien genie into the nucleus of plants and animals; artificial pollination; choosing the best products; modifying species through hybridization; mechanization of agricultural systems; artificial insemination; the use of hormones; mutations and genetic recombination; genetic engineering; polypeptides; and the introduction of animal genes into the structure of the plant genome. With each of the mentioned methods, changes are made in the economic and biological lives of humans.

Goals

1. Application of the science of heredity in various fields of economy, health, preparation of medicinal spices, environment, etc.

2. The role of contemporary technology in the development and practical use of the science of heredity

3. Treatment of fatal diseases using the science of engineering genetics and knowing the location and characteristics of genes

Keywords: Heredity, Genetics, Chromosome, Gene, Plants, Animals, Plasmid

INTRODUCTION

Experimental sciences have gone through their evolutionary stages over the past and present centuries. It has not been long since the life of scientific ideas in biology and proving new ideas, as well as the role of technology in the development of this science. Until around the 18th century, common people and even scientists believed in the false and unscientific idea of the creation of time, which in itself demonstrates the weakness and inadequacies of thought that existed until then and vitally, tremendous progress has taken place. The progress and development of any science is not limited to the discovery of a few formulas, symbols, definitions, and theories; the value of scientific fields is more related to their practical fields, such as their economic, health, social, and cultural sectors.

We can say with full confidence and conviction that with the advancement of technology and civilization and the increase in population, information, and human knowledge, mankind has developed very rapidly and increasingly in all fields of biological sciences, especially the science of heredity, and these developments are mainly based on the basic laws of genetics and heredity. The wide research of genetic science and advanced and modern methods have made it possible to exploit more genetic diversity in nature, as it is clear that changes at the molecular level and the engineering of genes have increased food products, recognition of diseases and their treatment, pharmaceuticals, etc. In addition, the research done on genetic material and the translation of gene codes is interesting for every student and lover of biology.

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APPLICATION OF HEREDITY

Humans have cultivated plants and domesticated wild animals even since prehistoric times. An abundant treasure of different types of agricultural plants and domesticated animals has emerged from a limited number of wild forms over a maximum of 10,000 years. The process of transitioning from wild to domestic is called "domestication". In this era, a person who lived by hunting animals and gathering fruits needed a living area of approximately 20 square kilometers. If agricultural plants are grown in this area today in scientific and technical ways, the results obtained from them will feed a population of more than 6,000 people.

The beginning of the era of cultivation of agricultural plants is called the "age of transition" from the Middle Stone Age to the "Young Stone Age". Without this basic cultivation and farming method and without this form of animal breeding, this has produced not only very productive species but even species that are compatible with unfavorable climatic conditions.

CULTIVATION OF PLANTS

How was man able to produce more and more productive forms of agriculture from low-yielding species? The breeding of animals and plants was initially based only on hand-picking a limited number of modified forms that man was able to discover in wild communities. Today, knowledge of the laws of heredity is the way forward for training methods (for domestic animals and plants). The general objectives of plant breeding are to increase production and improve quality. Among such measures are increasing the amount of protein and fatty substances, increasing the nutritional value of proteins, increasing the ability to cook or the amount of vitamins, improving pleasure, and extending the accumulation time. To increase the yield, it will be valuable if the resistance of the improved species against agricultural pests and insects is increased and the planting areas are expanded. In the end, we explain some of the methods for growing plants.

Despite the fact that plant cells lack plasmids, inserting a foreign gene into plants is usually successful indirectly through the use of a plasmid1.In addition, for the first time in basic scientific research, they succeeded in obtaining an antibiotic-resistant tobacco plant by inserting foreign genes (artificially in plant cells).

In plants in which foreign fertilization is promoted (for example, Joder), one of their clusters is artificially pollinated. Later, a few seeds are planted from each cluster, and the rest are kept. After collecting the results, only the seeds of the plants that produced the best results were planted again. Scientific and practical methods are still used in potato harvesting as follows: If they use the tubers (i.e., potatoes) of an extremely fertile mother plant as "agricultural seeds," they can create new and fertile species.

Through hybrid breeding, a "tank-like wheat" has been obtained, which combines the desirable characteristics of "stability against harsh winters" and productivity. To obtain this genus, Swedish wheat that was not very productive but was resistant to severe cold was crossed with English "head fat" wheat that was very sensitive to headaches but extremely productive. In this way, a new type of wheat was propagated.

In many plants in which foreign fertilization is common (for example, juari and joder), sex improvement is done through hybrids. Within a few years, approximately smooth species (inherited smooth lines) and heterozygotes are bred from the initial heterozygous plants via artificial pollination. If pair of such straight lines is mated, the female offspring (F1 hybrids) will clearly be more fertile than both of their parents. This form of emergence is called heterosis. Heterosis in cereals appears, for example, in the growth of seeds. This operation can appear in plants and animals by increasing their resistance to diseases and improving their ability to lay eggs.

ANIMAL BREEDING

Today, domesticated animals are primarily used to produce food. Their importance as working animals is generally limited to developing countries due to the mechanization of agricultural systems. Synthetic products have taken the place of wool and leather to some extent. On the other hand, the importance of domestic animals as human companions has increased: cats (about 40 species) and domestic dogs are among the best animal companions of humans in many countries.

The exact proof of the animal's origin is extremely valuable to the breeder during the breeding process. The average annual laying capacity of chickens has been greatly increased as a result of breeding measures and has reached 300 eggs today. In addition, the annual milking capacity of domestic cows has increased from 600 liters to approximately 5,000 liters (highly bred cows up to approximately 10,000 liters) **(Figure 1)**.

Artificial insemination is used to a large extent in animal breeding. The animals that use their sperm for fertilization are selected based on the characteristics that their babies must have. Today, 95% of breeding cows and chickens are artificially inseminated.

In order to multiply the hereditary talent in cows that have very high ability, the method of embryo transfer from the bred cow to the mother cow has been developed. Before a bred cow of exceptional ability is artificially inseminated, the process of "ovulation", during which 8 to 25 sperm cells are released at the same time, will be induced in this cow via the screwing of a hormone. After a week, the embryos, which are now as big as the head of a pin, are washed out of the breeding cow's womb and are placed in the wombs of

each of the mother cows, where they will continue their development until the time of childbirth [1].

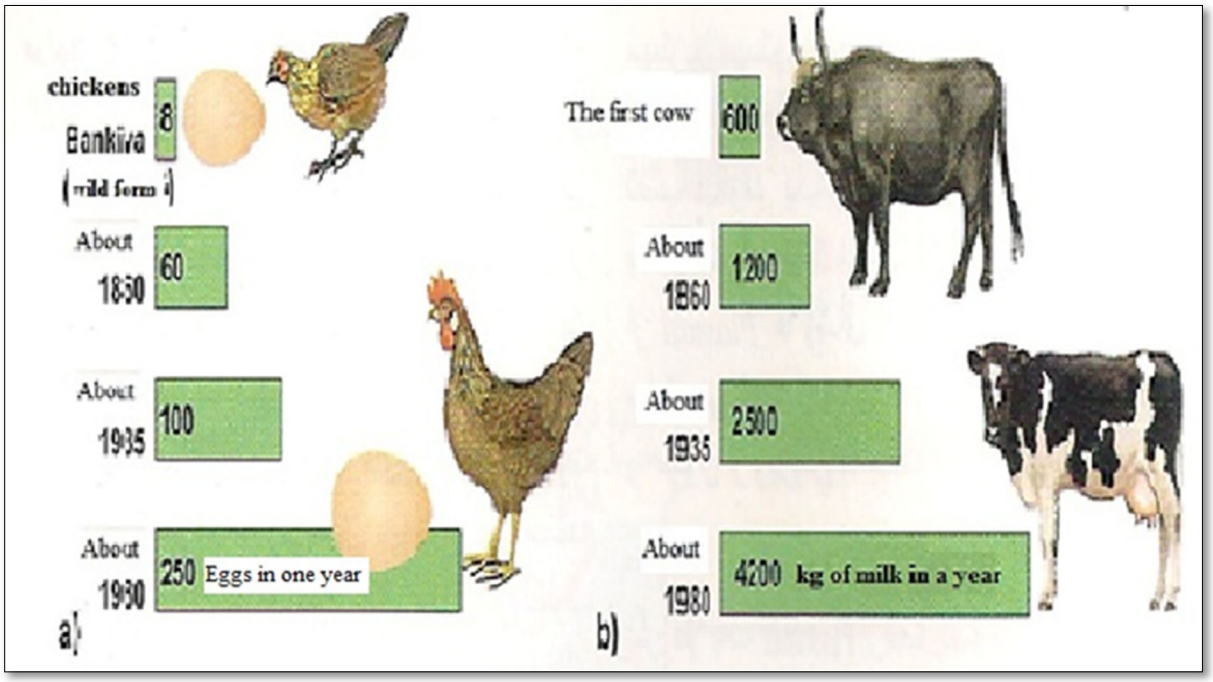

Figure 1. The annual yield of domestic animal. a) The number of eggs that a hen lays in a year; b) The annual milk yield of a cow in kilograms. Individual animals' abilities vary depending on their sex, food, and living conditions.

Application of genetics in plant and animal breeding humans began cultivating plants and domesticating wild animals in prehistoric times, but it was only 10,000 years ago that the vast majority of domesticated plants and animals of today emerged from their wild forms. Initially, breeding was random, resulting from the appropriate selection of mutations, whereas genetics today employs a variety of practical methods for breeding plants and animals. If man did not breed plants and animals, he could not increase his population to such an extent.

Plant breeding: Whenever we take a mixture of bean seeds as desired and weigh the seeds separately, we can get a graph of weight changes. Then, if we multiply the heavy seeds of this mixture by self-fertilization, the yield of bean seeds will be different. Now, if we continue this method for a relatively large number of generations, we will finally reach seeds that are inherited in terms of weight. These seeds are called “pure generation”, which are used to harvest more crops.

Animal breeding: Different types of pets in the European area are limited to twelve mammals and a number of birds. Dogs were domesticated 10,000 years ago, cattle 9,000-8,000 years ago, sheep and goats 5,000 years ago, and pigeons and chickens were domesticated at the same time, and many different breeds of domesticated animals have since evolved. These different races are all the offspring of mutants that have been selected and bred many times by human hands. All domesticated animals are social and crowd-loving like wild animals [2].

Jain [3] writes scientists are learning more about the genomes of agriculturally important plants and animals. For several years, they have been using DNA technology to improve agricultural production. Selective breeding of both domestic animals and crops has occurred naturally by mutation and genetic recombination over thousands of years.

Today, using the science of genetics, we breed sheep that produce better wool and cows that mature in less time and transfer genes that cause bigger muscles (muscles are a large part of the meat we eat). Identify it in a species of cow and transfer it to other species of cattle and even sheep.

Genetic engineering will quickly replace the traditional methods of plant breeding, especially for desirable traits such as resistance to weeds or pests, which are carried out by one or more limited genes [3].

Solomon [4] writes about the role and value of heredity in medicine.

Increasingly, doctors prescribe genetic tests to determine specific genetic mutations associated with disorders such as hemophilia, cystic fibrosis, Tay-Sachs disease, and sickle cell anemia. Gene therapy, which means using specific DNA to treat a genetic disease by fixing the genetic problem, is

another use of DNA technology which is currently in its early stages. Also, there has been a lot of development in the pharmaceutical sector, as human insulin produced by E. coli is one of the first proteins produced through genetic engineering and approved for use by humans. Before using new DNA techniques and producing genetically modified bacteria capable of producing human insulin, this hormone was exclusively derived from other animals, and many diabetics are allergic to insulin derived from animal sources because its amino acid sequence is completely different from human insulin. The ability to produce human insulin hormone by recombinant DNA methods brings many benefits to insulin-dependent diabetic patients. Human growth hormone (GH), made through genetic engineering, is available for children who need it to correct growth defects, especially hypothyroidism. Human samples include recombinant antiviral vaccines, influenza A, hepatitis B, and polio vaccines. In addition, new combined effective vaccines for certain bacterial diseases and human cancers are being developed [4].

As a result of the efforts of biologists, some hereditary diseases in humans, such as dwarfism, small fingers, congenital night blindness, Huntington's disease (a neurological disease, giant height, tumor-like growth on the body, and woolly hair, which are hereditary diseases in humans), albinism (lack of pigment), alkaptonuria (a disease in amino acid metabolism), forms of neurological and respiratory diseases, a disease in amino acid metabolism, sickle cell anemia (a hemoglobin disease), and Tay-Sachs disease, have been discovered. They are trying to make these diseases known and eradicate them in scientific ways. Sugar metabolism and glycogen storage disease (which is known as a recessive trait in humans) [5].

Recently, polyploidy has been widely used in plant breeding. Many geneticists believe that the use of polyploidy in plant breeding can be useful for at least two reasons:

Firstly, the number of polyploid chromosomes is greater than that of their diploid types, and therefore, polyploid cells are larger compared to the related diploids. Secondly, the size of the cell can be an important factor in the emergence of large and marketable plants. The evolution of many agricultural plants, including wheat, cotton, rice, and tobacco, as well as a number of ornamental fodder plants, has taken place through polyploidy.

Early humans, without knowing the ploidy level, chose many of these polyploid plants because of the size of the fruit, the strength of their competition with other plants, and their decorative value, but today polyploids in different types of plants have been scientifically it is done for different purposes [6].

Biological scientists have provided many opportunities to separate, identify, and study the genes of living organisms, to further improve hereditary defects and diseases, to provide accurate molecular methods and tools for the effective diagnosis and treatment of diseases, and to produce economically valuable plants and animals to be done easily and abundantly.

Now changes at the molecular level (genetic engineering) are widely used, as a result of which all kinds of modified plant species have been introduced to the market. Today, even by inserting animal genes into the structure of the plant genome, efforts have been made to produce hormones needed by humans, such as insulin, in plants [7].

American botanist Luther Burbank (1849-1926) is considered one of the greatest plant breeders ever. He developed disease-resistant potatoes that were later exported to Ireland to help fight potato blight and other potato diseases. During his lifetime, Burbank developed more than 800 varieties of plants. In most of the cases, Burbank crossed a disease-resistant plant with a plant that had more food production capacity. As a result, a series of plants were obtained because the farmers needed such plants in order to obtain more and better results. Transgenic plants are still an important part of our food supply in today's era. In the year 2000, 25% of soybeans and 25% of soybeans planted in the United States were transgenic crops or resulted from genetic modification. A large number of these plants contain ginsengs that produce natural insecticides. Therefore, there is no need to spray the fields with insecticides after this. Other plant products have genes that enable said plants to resist chemicals that destroy weeds. These genes help the agricultural plants survive when the weed plants are sprayed with chemicals.

Soon it will be possible to produce human antibodies in transgenic plants that can be used in the fight against diseases. So, it is possible to use transgenic plants in the production of plastic, whereas previously this plastic was obtained from petrochemical materials. In the same way, transgenic plants will be used in the production of foods that are resistant to spoilage.

One of the most important developments that have been made recently in this field is the genetic change of the rice plant that contains vitamin A; such rice is very important for humans from a health point of view [8].

CONCLUSION

All the innovations, advances, and discoveries of today are the result of scientific research, and scientific research will be fruitless without the use and development of modern technology.

In most cases, mutations (gene and chromosomal) are considered harmful and unnecessary in the lives of living organisms. However, despite this way of thinking, it has now been proven that some mutations are useful. Many scientists believe that the use of polyploidy in the term “plants” is due to the large number of polyploid

chromosomes compared to their diploid types, and therefore polyploid cells are larger compared to the related diploids, which results in large plants and marketable fruits. It is pleasant.

As stated in the article, humans have been able to access many spices by using the new DNA synthesis method. Based on DNA recombination, there have been advances in medicine and molecular biology sciences.

Lately, there has been a lot of activity in the cloning industry. Basically, a clone is a part of a cell that is genetically identical and came from a single cell. A cloned colony of bacteria and other microorganisms can be easily grown, but in the case of multicellular organisms, it does not always lead to success. There are attempts to create another similar organism by copying DNA strands. Until now, scientists have not been able to achieve such a success, and if genetic scientists achieve such a goal, another problem and question will be faced by humanity. In any case, in today's era, the breeding of animals and plants has accelerated with the development of genetic science, and agricultural and animal products have become more and better, as has the role of the science of heredity in raising the level of individual and social life, providing suitable food, and preventing diseases. It plays an important role.

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