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GENETICS: AN EXPERIENCE

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Introduction:

We can experience genetics in our daily life. When we observe our surroundings we find that organism always give birth the offspring similar to themself *i.e.*, the progeny always has the same characteristics as the parent. For example, the progeny of a dog is like a dog, the progeny of a cat is like a cat, the progeny of a human is like a human, and the progeny of a plant is like a plant etc.

The scientific basis of this similarity is heredity, despite the similarity, the organisms of any species are never exactly alike *i.e.*, they have variation. All these facts are the basis of genetics *i.e.*, in genetics, we study about heredity and variation.

Variation is that which shows the difference between the different offspring of the same parents, *i.e.*, on the basis of variation; we can identify two or more peoples separately from each other.

Now if we talk about heredity, then heredity is that through which the progenies of an organism look similar to him *i.e.*, all the heritable characters come under heredity or heredity includes all the characters that transferred from parents to their offspring. If we try to understand this heredity in a comprehensive way, then we will find that there is some or the other thing which works to transfer our heredity to our offspring.

Scientifically this thing is called chromosome it is found in the cells of the body of organisms *e.g.*, there are 46 (23 pairs) chromosomes in the cells of the human body. Somatic cells are cells that do not participate in sexual reproduction. In somatic cells, chromosomes are always found in pairs and represented by 2n.

The cells of human body which take part in sexual reproduction are called reproductive cells, in which the chromosomes are present in single copy only and represented by n. Sperm cells in the male and egg/ovum cells in the female are the reproductive cells of the human body.

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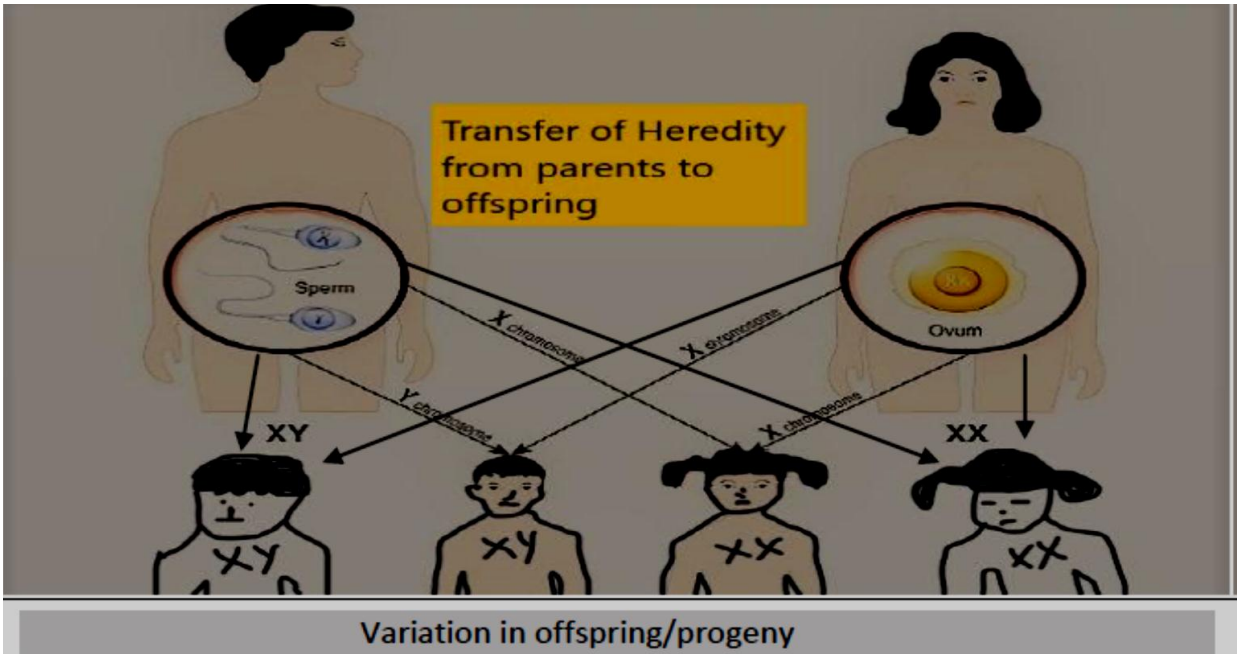
At the time of sexual reproduction, the sperm cells of the male parent and the egg cells of the female parent reach into the uterus, where the sperm cells of the male parent (23 chromosomes) and the egg cells of the female parent (23 chromosomes) join together and make a zygote having 46 chromosomes.



Variation in offspring/progeny

This zygote develops and forms an embryo, and in this embryo, growth and development continues through cell division, so that after about 9 months a baby is born, this entire process is called sexual reproduction. Most of the animals have sexual reproduction.

Plants have both sexual and asexual reproduction. Plant cells that do not participate in sexual reproduction are called somatic cells. Chromosomes are always found in pairs in somatic cells and are represented by 2n.

Root, stem and leaves etc. of plants are made up of somatic cells. Plant cells that participate in sexual reproduction are called germ/reproductive cells. Chromosomes in reproductive cells are single and not in pairs and are denoted by n.

Reproductive cells of plants are formed in the pistil and stamens located in the flowers of plants. In asexual reproduction, fusion of reproductive cells does not take place. The new plants are formed by mitotic cell division mainly in the vegetative parts of plants.

For example, in ginger, turmeric, potato, banana, onion, garlic, etc., new plants are formed by underground stem, in lemon and orange by roots, while in sugarcane, rose and sweet potato, new plants are formed by normal stem.

Although in some plants like mango, lemon, orchid, etc., asexual reproduction is also done by seeds, but in these seeds, embryo is formed without the fusion of male and female gametes, this process is called apomixis.

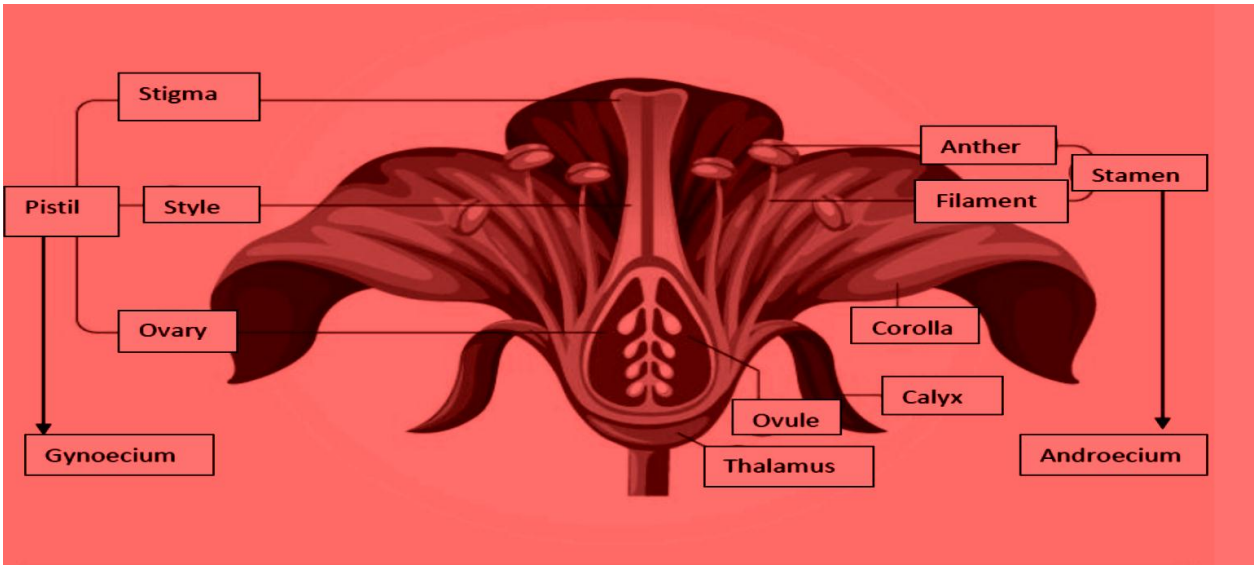
Sexual reproduction involves the fusion of reproductive cells and the formation of a new plant is by the seed. The time frame of sexual reproduction in plants varies from species to species. Sexual reproduction in plants occurs in the flower. There are mainly 4 parts in the flower *e.g.*, calyx, corolla, androecium and gynoecium.

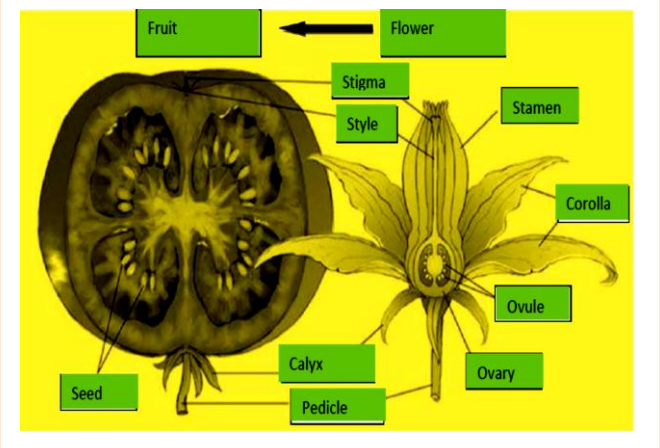
The calyx is usually green in color and it is the outermost part of the flower and protects the essential parts (androecium and gynoecium) of the flower in the bud stage. The corolla is larger, colorful and attractive than the calyx so it attracts insects and help in cross pollination.

Androecium is found inward from the corolla and it is male reproductive organ. Androecium is made up of many stamens. Each stamen has anther in which pollen grains are formed. Pollen grains have male gametes (micro gametophyte).

Gynoecium is found inward from the androecium and it is female reproductive organ. The unit of gynoecium is pistil. Pistil has three parts. The lower part is called the ovary, the part above the ovary is called the style and the part above the style is called the stigma. Female gametes (mega gametophyte) are formed in the ovule present inside the ovary.

Therefore, male and female gametes are formed in the sexual reproductive organs located in the flower. Seed is formed by the fertilization of male and female in the ovule, from which a new plant is originates.





In this way we have seen that the characters of the parents are passed on to their progenies through chromosomes and we have also seen that germ/reproductive cells have half number of chromosomes than somatic cells so that the number of chromosomes remains the same from generation to the generation.

Now the question arises that what is the thing in these chromosomes by which our characters reach to our progenies. In scientific language, this thing is called gene. These genes are present in chromosomes and they made up of a special type of genetic material called deoxyribonucleic acid (DNA). Although in some viruses, they are made up of ribonucleic acid (RNA). These genes have the information for our characters, so that our characters reach to our progenies.

Now the question arises whether all our characters reach to our progenies, then the answer is no, it is not so. The characters which we learn after taking birth are called acquired characters like as knowledge, skill in sports, skill in working hard, good health etc. All these characters are not transferred from parents to their progenies. Whereas the characters such as our body shape and our complexion, etc. are transferred from parents to their progenies and are called as heredity. The transfer of such characters from parents to progeny is called inheritance.

In this way, we understood that genetics is that branch of science in which we study heredity and variation or we can also say that genetics is that branch of science in which we study the structure, organization and transmission of genes from parents to their offspring and development of characters through them.