

Speed Breeding for Crop Improvement

Himanshu Papnai

Department of Agricultural Sciences

Sri Dev Suman Uttarakhand University, Uttarakhand, India

Abstract — Today the population of the world is increasing continuously and with the increasing population there is a need to increase the production of food. Because if the population keeps increasing and the production decreases then it will become a big problem. Scientists are bringing new technologies in the field of agriculture so that production can be increased in the field of agriculture. Speed breeding is one such technology where the growth of the plant is increased in a very short time and production is also increased in a very short time. This technique has been done on only a few plants and research is still going on on it. According to the speed breeding technique if wheat, gram, barley, paddy are given grow light for 22 hours and the light is kept off for 2 hours then their production increases.

Keywords: Speed Breeding, Controlled Environment, Generation Advancement

I. INTRODUCTION

Speed breeding is made up of two words. Speed means speed. And breeding means production. That means it means fast production.

There are 195 countries in the whole world and the population of the whole world is 800 crore but the food produced

- 55% of it is for humans
- 36% for animals
- 9% is produced for companies

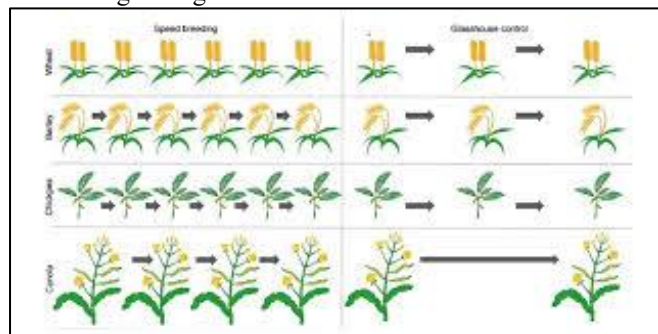
But by 2050 the world population is estimated to be 980 crore and we will have to increase the food production along with it.

NASA whose full name is National Aeronautics and Space Administration. Which was established in 1958, it is a government agency of America which studies space science.

In projects like NASA's veggie project and advanced plant habitat, plants are cultivated on the space station. The principles of speed breeding are applied in these projects.

There is no father of speed breeding but its credit mainly goes to Watson L.A. He understood and applied the principles of speed breeding in the field of agriculture to reduce crop breeding and to develop new varieties quickly.

In speed breeding, plants are given light for 22 hours and then light is not given for 2 hours and the lights used in this are called grow lights.



Grow light means when you grow plants in a closed room where sunlight does not reach, if you artificially provide light to the plants and the plants carry out photosynthesis and the lights we use for plants are called grow lights.

A. Why do plants need photosynthesis?

– Photosynthesis is a process by which plants take sunlight and make their food glucose which is most important for speed breeding. This process is done through grow light. Plants require 400 to 700nm wavelength.

– Blue light (400-700nm)- If we use blue light in speed breeding

Then this light helps in sprouting from the centre and growth of leaves. This is very important in the initial period.

– Red light (600-700nm)

This light helps in growing flowers and fruits and increases the length of the stems.

– Full Spectrum Light

In this, blue, red and to some extent green light is used Which is useful for seeding, growth and flowering in the plant.

If these lights are used in speed breeding, then crop production increases



1) Temperature: speed breeding We maintain the temperature according to the crop we plant. When we sow a seed, the temperature required for germination is different, hence we maintain a different temperature for germination of the seed and after that a different temperature is maintained for the growth of the plant.

2) Nutrition - In speed breeding we give nutrition value to the plants. 17 types of nutrition are required for the growth of the plant which includes 6 main nutrients and 8 micro nutrients. Apart from this, carbon, oxygen and hydrogen are obtained by the plant from air and water.

B. 6 Main Nutrients

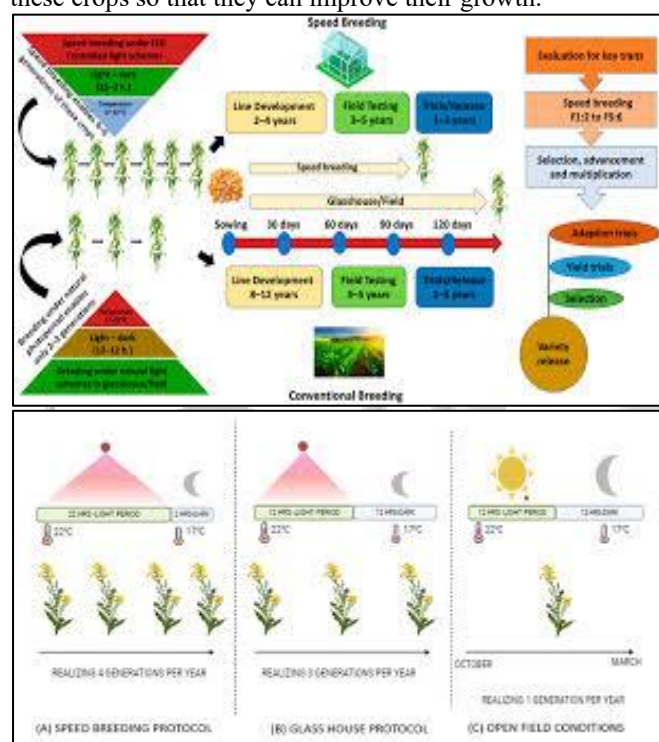
- 1) Nitrogen - It is very important for the growth of the plant and production of chlorophyll
- 2) Phosphorus - It is very important for the development of roots, flowers and fruits
- 3) Potassium - It helps the plant to fight diseases and drought
- 4) Calcium - It strengthens the cell wall and helps in the development of fruits

- 5) Magnesium - It is an important component of chlorophyll which helps in photosynthesis
- 6) Sulfur - It is necessary for the synthesis of proteins

C. Eight Micro Nutrients

- 1) Iron - It helps in the synthesis of chlorophyll and activating enzymes
- 2) Manganese - It helps in photosynthesis and activating enzymes
- 3) Zinc - It is necessary in the synthesis of enzymes and hormones
- 4) Copper - helps activate enzymes and photosynthesis
- 5) boron - essential for cell wall development
- 6) Molybdenum - involved in nitrogen metabolism
- 7) Chlorine - involved in water balance and photosynthesis
- 8) Nickel - essential for some enzymes

In speed breeding, we give nutrition value to all these crops so that they can improve their growth.



D. What is the difference between traditional farming and speed breeding

Traditional farming means the farming that farmers have been doing for centuries and speed breeding means that you are increasing the fertility of the plant due to which the growth of the crop is happening quickly

Traditional farming costs less and requires less resources but speed breeding costs more.

Till now speed breeding has been successfully used in wheat, gram, soybean, pea, rice, barley, maize, tomato and it has been observed that the production was very good and the production was also obtained very quickly.

II. CONCLUSION

Speed breeding is a very good technique but this technique has been used in only a few crops and the world population is constantly increasing. With the increasing population, food production will decrease. To avoid this shortage, scientists

are constantly experimenting with new techniques to increase food production. Speed breeding is one such technique through which the crop is ready in less time. Currently, speed breeding is being used in many crops. If this crop is successful, then in the coming time we can use this technique to increase food production

REFERENCES

- [1] Watson, Alex, Subir Ghosh, Matthew J. Williams, William S. Cuddy, James Simmonds, Maria-Dolores Rey, Lee T. Hickey. 2018. "Speed Breeding Is a Powerful Tool to Accelerate Crop Research and Breeding
- [2] Hickey, L.T., German, S.E., Pereyra, S.A., Diaz, J.E., Ziem, L.A., Fowler, R.A., Platz, G.J., Franckowiak, J.D., Dieters, M.J. (2017). Speed breeding for multiple disease resistance in barley
- [3] Mobini, S. H., Lulsdorf, M., Warkentin, T. D. and Vandenberg, A. (2016). Low red: far-red light ratio causes faster invitro flowering in lentil. Canadian Journal of Plant Science
- [4] Ghosh, S., Watson, A., Navarro, O E G., Gonzalez, R H R., Yanes, L., Suarez, M M., Simmonds, J., Wells, R., Rayner, T., Green, P., Hafeez, A., Hayta, S., Melton, R.E., Steed, A., Sarkar, A., Carter, J., Perkins, L., Lord, J., Tester, M., Osbourn, A., Moscou, M J., Nicholson, P., Harwood, W., Martin, C., Domoney, C., Uauy, C., Hazard, B., Wulff B B H., Hickey, L T. (2018). Speed breeding in growth chambers and glasshouses for crop breeding and model plant research.
- [5] Zheng, Z., Wang, H., Chen, G., Yan, G. and Liu, C. (2013). A procedure allowing up to eight generations of wheat and nine generations of barley per annum.
- [6] Went, F. (1953). The effect of temperature on plant growth. Annual Review of Plant Physiology.