Application of Genotype and Environment Interaction in Crop Breeding

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Keywords: Genotype, Environment, Crop Breeding

Abstract: Crop breeding is the key step of crop quality production, so it is of great practical significance to discuss the concrete development of crop breeding. From the current specific data analysis, crop breeding should not only emphasize the use of experience, but also emphasize the application of science and technology, so in the process of crop breeding, based on the current stage of biological theory to adopt advanced technology, the results of breeding will be more ideal. From the specific planting of crops, its growth is affected by genes and also restricted by environmental factors, so it is necessary to consider the genetic and environmental factors in the process of breeding. This paper analyzes the application of genotype and environment interaction in crop breeding in order to provide help and guidance for current breeding.

1. Introduction

Based on the analysis of the present agricultural means of production, it will be found that the quality of seeds will have a significant impact on the growth of crops, so breeding has become an important means of productive efficiency in agricultural planting. From the current research data, crop growth will be affected by genes, but also limited by environmental factors, so in breeding, the need to analyze the genetic and environmental interactions of crops, so that the seeds will be more regionally targeted. With the continuous development of biotechnology, the scientific nature of breeding is more prominent, and the results of analysis and discussion of crop genes and environment are more clear.

2. Analysis of Genotype and Environmental Interaction

From the point of view of realistic analysis, in order to effectively use genotype and environmental interaction in breeding work, we should first understand what genotype and environmental interaction is. From the concept analysis, the so-called environmental interaction specifically refers to the genotype determines the traits of organisms, but the performance of biological traits is also affected by the environment (Fig .1).Simply put, the fundamental factor that determines crops is genes, so in the process of breeding, we need to choose crops based on genes. But in the process of crop growth, it will be affected by the environment, and in the same environment, the dominant performance of the more prominent crops, its overall status is often more prominent, so it can be based on its breeding analysis. In summary, breeding can realize the optimization of crop selection from the early performance of crops, which is of great significance to the scientific promotion of breeding and the high efficiency of crop production.

  DOI: 10.25236/medsbe.2020.019

Figure 1 Genotype and environmental interactions

3. Application of Genotype and Environment Interaction in Crop Breeding

From the point of view of realistic analysis, in order to effectively apply genotype and environmental interaction in the process of crop breeding, we need to analyze the concept of genetic rate, and then realize the scientificization of breeding based on conceptual understanding.

3.1. Hereditary Rate

From the concept analysis, the so-called heritability rate is also called heritability, which refers to the important genetic parameters of the relative ratio of genetic variation to phenotype variation. From the performance point of view, the genetic rate is large, the early selection effect is good, such as plant height, heading period and other traits, but the genetic rate is small, and the early selection effect is poor, such as the number of ears, yield and so on. For the present study, if it is relative to a quantitative trait, the cumulative genetic variance in the phenotypic variance of a population is the heritability of that trait in that population. Of course, the heritability rate has the broad sense and the narrow sense distinction, the above content is the narrow sense concept heritability rate.

In terms of heritability in the broad sense, it refers specifically to the proportion of genotype variance in phenotypic variance. The generalized heritability rate can be expressed as: H2=VG/Vp; the narrow heritability rate can be expressed as H2=Vg/Vp. In these two expressions, Vg means cumulative genetic variance, also called genetic variance, VG means genotype variance, and Vp means phenotypic variance.

From the specific data study, the genotype variance is equal to the cumulative genetic variance, the dominant variance and the upper variance (also the interaction variance), and the phenotypic variance is equal to the sum of the genotype variance and the environmental variance when the genotype and environment do not exist. Therefore, heritability is a very important quantitative index, especially in narrow sense, which has become the basic quantitative index for selecting breeding at present.

3.2. Application Analysis

After defining the concrete concept, applying the corresponding theory based on the concrete understanding of the concept, the effect of breeding will be more ideal. From the specific analysis, the specific use of genotype and environmental interaction needs to implement the following measures.

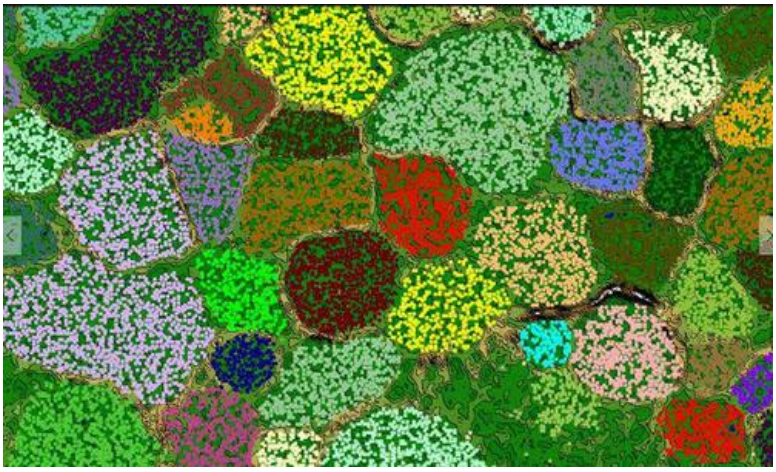

Figure 2 Plant genotype

The first is the need to estimate heritability. As mentioned above, in the process of breeding, it is necessary to focus on the selection and cultivation of seeds with reference to heritability rate, so the more accurate the estimation of heritability rate, the more prominent the specific breeding work effect will be. Therefore, the estimation of heritability should be emphasized. There are two main methods for estimating the genetic rate :(1) to analyze the parent's regression method, that is, to analyze the specific performance of the progeny crops and the performance of the parent belt crops, so as to determine the performance difference, and then to analyze the genetic rate. Of course, in practice, in addition to the above two methods, we can use the selection difference I in addition to the actual amount of genetic acquisition obtained in the manual selection process, that is ,ΔG/I, which is called the real genetic rate. In conclusion, estimating heritability is the key work of breeding, so it is necessary to master the correct method and emphasize the accuracy of the estimation.

followed by seed cultivation. In the practice of breeding, the cultivation of seeds is a very important work, which plays an important role in seed selection. In the process of seed cultivation, attention should be paid to the following :1) initial seed situation registration and management. In the early stage of breeding, in order to distinguish and evaluate the selection of seeds, it is necessary to make a comprehensive registration of the specific conditions of the initial seeds, such as the number of seeds, the environmental conditions of the seeds, such as temperature and humidity, and the evaluation of the sprouting rate of the seeds after germination, so as to better determine the sprouting rate of different varieties under the same conditions. 2) Initial registration. For example, the specific growth period of seed germination growth stage, seedling characteristics and so on, which has significant significance for early seed selection. 3) The seedlings need to be managed effectively. In the seedling growth stage, the water needs, nutrition needs and so on are supplied, and the record work is done well, so that the research and analysis of the whole seedling stage will have more authenticity and reference value.

The second is the management of the crop growth cycle. Crop has its fixed growth cycle, but different seeds, its specific growth cycle will be different, and to achieve breeding, we must analyze the difference of seeds, so as to achieve scientific seed selection. management during the growth period of the crop, the main measures are as follows :1) the growth record of the crop. Take wheat as an example, its growth will go through many stages of germination, leaf extraction, jointing, flowering, grouting and maturation. Complete crop growth cycle information can be obtained by registering the specific conditions of the crops at each stage. 2) Environmental records of crops. The growth of crops can not be separated from the environment, such as temperature, humidity, air circulation and so on will have an impact on the growth of crops, so in the crop growth cycle, the specific environmental conditions of crops are recorded, which can provide more detailed information for the analysis. 3) Record of crop anomalies. In the growth of crops, there will be a number of diseases, which will be recorded as abnormal conditions, so that the planting of crops can be more comprehensively assessed.

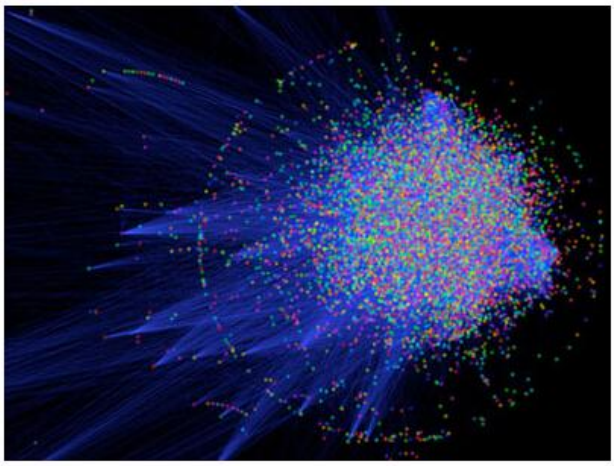

Figure 3 Biological phenotype

Finally, crop harvest analysis is carried out. In the practice of breeding, crop harvest analysis also has a very significant effect on seed selection, so it is necessary to emphasize crop harvest analysis. Take wheat as an example, the following aspects can be compared and analyzed after harvest :1) the size of wheat ear, the specific size of wheat ear, the degree of fullness of wheat ear, etc. 2) The condition of straw, such as the stoutness of straw. 3) Overall harvest, i.e. single yield in the breeding area, etc. Through the specific analysis of these elements, we can more comprehensively identify the specific yield of different varieties of wheat under the same planting conditions. On the basis of determining the yield of wheat, the parent seed is analyzed and compared with the offspring, so the influence of genotype and environment on wheat seed will be more clear, and the superiority of seed itself will be more prominent based on the specific results. In summary, in the concrete work practice, the crop harvest analysis and the contrast judgment is an important means to carry on the seed screening in the breeding process, therefore must make the more comprehensive discussion to its utilization.

4. Conclusion

To sum up, our country is a large agricultural country, but also a large population, food problems have always affected our country, so the emphasis on scientific breeding, to achieve high yield of crop production, which has a positive effect on the food security of our country. From the specific analysis of breeding, seeds in the process of planting will not only be affected by genes, but also by the environment, so to achieve breeding needs to do a comprehensive discussion of these two elements. The interaction between genotype and environment is an important part to be emphasized in crop breeding practice. Therefore, it is of great practical value for practice to do a good job in analyzing the application of genotype and environment in breeding practice. In short, in the practice of breeding, to achieve the scientific promotion of breeding, not only to use excellent experience, but also to use advanced technology and theory, genotype and environmental interaction is an important achievement in biological research, and the effect in seed cultivation is remarkable, so the practical value of its application is emphasized.

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