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GENETIC DIVERSITY OF BARLEY FOLIAR FUNGAL PATHOGENS (ГЕНЕТИЧНЕ РІЗНОМАНІТТЯ ПОЗАКОРЕНЕВИХ ГРИБКОВИХ ЗБУДНИКІВ ЯЧМЕНЮ)

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Борошниста роса, сітчаста плямистість, і листова іржа є важливими позакореневими грибковими збудниками ячміню. Грибкові листові патогени негативно впливають на врожайність і якість рослин ячменю. Зміни вірулентності, які можуть відбуватися різними шляхами, можуть зробити рослини більш стійкими . Такі фактори, як мутація, розмір популяції та випадковий генетичний дрейф, потік генів та генотипів, системи розмноження, відбір, обумовлений резистентністю основних генів, та кількісна резистентність можуть впливати на генетичну різноманітність патогенних грибів.

Ключоі слова: *ячмінь; Hordeum vulgare ; Blumeria graminis ; Pyrenophora teres ; генетичне різноманіття*

Powdery mildew, net blotch, scald, spot blotch, barley stripe, and leaf rust are important foliar fungal pathogens of barley. Fungal leaf pathogens negatively affect the yield and quality in barley plant. Virulence changes, which can occur in various ways, may render resistant plants to susceptible ones. Factors such as mutation, population size and random genetic drift, gene and genotype flow, reproduction and mating systems, selection imposed by major gene resistance, and quantitative resistance can affect the genetic diversity of the pathogenic fungi.

Keywords: *barley; Hordeum vulgare ; Blumeria graminis ; Pyrenophora teres ; genetic diversity*

Barley (Hordeum vulgare L.) is one of the most important cereal crops that has been grown for thousands of years since prehistoric times, and is used in animal feed, malt products, and the food industry. Globally, it ranks fourth in grain production with approximately 150 million tons of production after wheat, rice, and maize [1].

Barley leaf diseases cause significant decreases in yield in all areas where barley is cultivated, and at the same time, reduces the quality. The use of fungicides or disease-resistant

barley genotypes is effective in disease control, but the evolutionary potential of pathogens poses a risk of overcoming resistance genes in the plant and neutralizing fungicide applications [2,3,4]. Information about the evolutionary potential of pathogens is useful in developing control strategies [5,6].

To understand the process by which the effectiveness of the resistance gene is broken down, the processes governing pathogen evolution must be understood. The genetic makeup and evolution of populations is a result of the interaction between the five forces: mutation, reproduction and mating system, gene and genotype flow, population size and random drift, major gene resistance, and selection imposed by major gene resistance and quantitative resistance. Mutation is one of the sources of genetic variation. As a result of mutations, changes in the DNA sequence of individual genes occur and these generate new alleles in populations. New virulent strains of plant pathogens can be formed through the mutations and these could break the major gene resistances [4].

Population size affects the likelihood that mutants will be present. More mutants are observed in large populations compared to small populations and these can affect the diversity of genes in a population through random genetic drift. Disease management programs or climatic extremes that keep pathogen population size small, limit gene diversity and help to control the disease [4,6].

Gene flow is a process in which certain genotypes or genes are exchanged among populations. Greater genetic diversity is possible with pathogens that display a high degree of genotype/gene flow. Anthropogenic activities can affect the size of the genetic neighborhood. Humans have transported many different pathogens well beyond distribution borders through agriculture and intercontinental travel and trade. Distribution of gene diversity among and within populations is affected by reproduction and mating systems. Reproduction can be mixed, asexual, or sexual. Pathogens that undergo regular recombination may pose greater risks.

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VITAMINS AND MINERALS : CLASSIFICATION AND FUNCTIONS (ВІТАМІНИ ТА МІНЕРАЛИ: КЛАСИФІКАЦІЯ ТА ФУНКЦІЇ)

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В статті розкриваються типи та функції вітамінів та мінералів, їх вплив на здоров`я людини та продукти в яких вони містяться.

Ключові слова: *вітаміни, мінерали, функції вітамінів та мінералів, вплив на здоров'я вітамінів та мінералів, продукти в яких містяться вітаміни та мінерали.*

The article reveals the types and functions of vitamins and minerals, their impact on human health and products in which they are contained.

Keywords: *vitamins, minerals, functions of vitamins and minerals, health effects of vitamins and minerals.*

Vitamins and minerals are two of the main types of nutrients that your body needs to survive and stay healthy. Vitamins help your body to grow and work the way it should. There are 13 essential vitamins — vitamins A, C, D, E, K, and the B vitamins (thiamine, riboflavin, niacin, pantothenic acid, biotin, B6, B12, and folate). Vitamins have different jobs to help keep the body working properly. Some vitamins help you to resist infections and keep your nerves healthy, while others may help your body to get energy from food or help your blood to clot properly. Like