INTERNATIONAL JOURNAL OF RESEARCHES IN BIOSCIENCES, AGRICULTURE AND TECHNOLOGY
© VISHWASHANTI MULTIPURPOSE SOCIETY (Global Peace Multipurpose Society) R. No. MH-659/13(N)
www.vmsindia.org

EFFECTS OF ABIOTIC AND BIOTIC STRESS ON PLANTS

V. K. Rewatkar
Dept of Botany, Shri Dnyanesh Mahavidyalaya, Nawargaon, Chandrapur

Abstract:
Man has become like machine due to modernization and mechanization which is a cause of weakened immunity and many stress prone diseases. Likewise plants are constantly facing to both abiotic and biotic stresses that reduce their productivity. Plant responces to these stresses involve many physiological, molecular and cellular disorders. The damages caused by these various living and nonliving agents can appear very similar. A plant's response following exposure to abiotic and biotic stress depends on its developmental stage which leads to phenotypic damage. "Resistance" and "tolerance" are the terms used to denote the ability of plant manage the stress, be it biotic or abiotic. This review aims at the effects and tolerance of abiotic and biotic stress on plants.
Keywords: - Abiotic stress, biotic stress, phenotypic damage.

Introduction

This century is called "Century of tension or stress" for both human beings and plants. Abiotic stress is defined as the negative impact of nonliving factors such as sunlight (Extreme temperature), wind, salinity, over watering (flood), drought, tornadoes, wildfire, radiations, and chemical toxicity on living organisms [1]. Abiotic factors are naturally occurring and essentially unavoidable. Plants are especially dependant on environmental factors, so it is particularly constraining and concerning about the growth and productivity of crops worldwide [2].

Biotic stress is stress that occurs as a result of harmful or damageable activities caused by harmful and beneficial insects, weeds, bacteria, viruses, fungi, parasites and cultivated or native plants [3]. During the latter half of the 20th century, agriculture became increasingly reliant on synthetic chemical pesticides to control the pests and diseases. However, in the 21st century this reliance on chemical control is becoming unsustainable due to the emergence of resistance in the target pests and negative impacts on biodiversity and also on the health of agricultural workers and even consumers[4].

EFFECTS OF STRESSES

Abiotic stress, as a natural part of every ecosystem, will affect organisms in a variety of ways which may be either beneficial or detrimental. The location of the area is crucial in determining the extent of the impact, the higher the latitude of the area affected, the greater the impact of abiotic stress. A plants first line of defense against abiotic stress is in its roots. If the soil holding the plant is healthy and biologically diverse, the plant will have higher chance of surviving stressful conditions [5]. Plants also adopt very differently from one another even living in the same area.

Biotic stress affects photosynthesis by reducing leaf area and by inducing stomata closer [6]. Plants have co-evolved with their parasites for several hundred years resulting into the selection of a wide range of plant defense against microbial pathogens and herbivorous pest to minimize frequency and impact of attack. This is nothing but adaptation, but pathogens have evolved mechanism to overcome this adaptation. In order ti understand plant biotic stress resistance we require detailed knowledge of these interactions from the molecular to the community level [4].

In the recent years, research has mainly concentrated on understanding plant response to individual abiotic or biotic stresses [7-9]. Plants use various signaling pathways depending on the stresses. It seems that plants respod to a specific manner when they have to face more than one stress simultaneously, and the response cannot be predicted based on the plant's response to the individual single stress [10]. Various interactions can take place between the defenses and induced after perceptions of the stresses.

Conclusions

A plant's response to abiotic or biotic stress strongly depends on its developmental stage and the environmental conditions to which it is subjected [11]. The combination of both stress types leads to an increased accumulation of large number of signaling pathways. Many approaches can help plants to resist under combine stress.

The "Omics" technology is one of the approaches. Little is known about 'omics' (Transcriptomics, Proteomics' and metabolomics) characterization of abiotic and biotic stress combination.

References

1. "forestrynepal" *forestrynepal.org*. Retrieved **2015**.12.03
2. Gao, Ji-Ping, et al "Understanding Abiotic Stress Tolerance Mechanism : Recent Studies on Stress Response in Rice" Journal of Integrative Plant Biology 49(6):742-750, **2007.**
3. Flynn, Paula "Biotic vs. Abiotic-Distinguishing Disease Problems from Environmental Stresses" Retrieved **2013**-05-16.
4. Roberts, M **(2013**) "Preface: Induced Resistance to biotic stress" New Phytologist.
5. Brussaard, Lijbert, Peter C.,de Ruiter and George G. Brown "Soil biodiversity for agricultural sustainability" Agriculture,Ecosystem and Environment 121:233-244, **2007**.
6. Flexas, J. F. **(2012**) "Terrestial Photosynthesis In A Changing Environment" Cambridge :Cambridge University Press.
7. Todaka, D.; Nakashima, K.; Shinozaki, K.;Yamaguchi-Shinozaki, K. Toward understanding transcriptional regulatory networks in abiotic stress responses and tolerance in rice. *Rice J* **2012**,5,1-9
8. Stotz,H.U.; Mitrousia, G.K.: de Wit, P.J.G.M.; Fitt, B.D.L. Effector-triggered defence against apoplastic fungal pathogens. *Trends Plant Sci.* **2014**, *19,491-500*
9. Thakur, M.; Sohal, B.S. "Role of elicitors in inducing resistance in plants against pathogen infection : A Review *ISRN Biochem.* **2013.**
10. Atkinson, N.; Urwin, P.-E. The interaction of plant biotic and abiotic stresses : From genes to the field. *J. Exp. Bot.* **2012**, *63, 3523-3544*.