Stress Synergisms in Plants

International Workshop at Tata, Hungary, August 23–26, 1998

Preface

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The actual environmental conditions mostly if not always deviate from the appropriate condition required for the optimal function of living organisms. In such suboptimal or extreme environment plants show irregular responses in their biochemical-physiological processes. During the past decade one of the main approaches of stress physiological research was to find correlations between the type, measurement of the stress factors, and the physiological responses shown. In these studies the question of the significance and specificity of individual stress responses was also addressed.

As the result of the intense field research a well defined picture has been established. Most stressors can be considered as agents of oxidative stress causing a general breakdown of the functioning structure *via* stress-generated reactive oxygen species. Simultaneously, all these stress factors also have specific individual action sites and/or modes of action causing specific damages at levels of both structure and function within the cell.

The main goal of the *International Workshop on Stress Synergisms in Plants* was to bring together scientists interested in stress-induced alterations of metabolic processes related directly or indirectly to photosynthesis in plants and autotrophic microorganisms. The most recent results regarding responses of photosynthesis and plant productivity to various stress factors were discussed.

The 68 participants came from 19 countries: Austria, Belgium, Germany, Greece, Hungary, India, Israel, Japan, Poland, Spain, Netherlands, Switzerland, France, Bulgaria, Brazil, Czech Republic, Ireland, Romania and Ukraine. About 24 of the participants were Ph.D. students, postdoctoral fellows or young scientist early in their career.

During the three-day meeting at Tata 15 plenary lectures were presented in 5 sessions: 1. General aspects of stress and photosynthesis. 2. High light and temperature stress. 3. Light stress and nutrition deficiency. 4. Ozone and elevated CO_2. 5. Heavy metal and biotic stress.

Five additional sessions with 18 oral presentations covered most of the recent progress regarding the five topics and about 30 poster contributions were on display during the entire meeting. Special attention was given to synergistic effects with stress factors such as oxidative conditions, drought, and salinity on photosynthesis. Valuable contributions were also addressed to techniques of stress detection such as spectrometric methods for multi-factor analysis of the plant, imaging laser-induced fluorescence or thermoluminescence.

At the end of the Workshop, the Organizing Committee chaired a session devoted to a general discussion and concluding remarks. It was pointed out that in the open a specific and local stress does not only influence photosynthesis but may also simultaneously affect other metabolic plant pathways. A controversial discussion took place about the role of oxidative stress and subsequent damages in photosynthetic organisms, as a final result of all stress reactions induced by a large variety of stressors. As plants are prisoners of their environment, they have developed a high capacity to cope with most effects induced by natural and anthropogenic stress factors. Modifications of metabolic pathways and damages to structures will only occur if the stress compensation capacity is overloaded. Therefore, results of laboratory experiments taking only a single stress factor into account will not be sufficient to explain the multiple stress response induced in the open. Lack of sufficient photosynthesis research in the field of biotic stress, reflected by the small number of contributions in the XIth International Congress on Photosynthesis, was also discussed at the Workshop. Possible reasons were suggested, such as the difficulty to experimentally control these stress factors. It was emphasized that, on the one hand, advances in molecular biology have promoted a better understanding of plant parasite genomes and replications. On the other hand, a similar expansion of knowledge is needed in the physiology of infected plants.

The large number of studies regarding heavy metals and light revealed that photosynthesis researchers have accumulated a lot of information on influence of these stress factors in isolated subsystems. Accordingly, it was considered that *in-vitro* experiments should not given priority anymore because there is an urgent need to study the photosynthetic apparatus in its entirety, focusing on regulation and stress-induced photoprotective and photoinhibitory mechanisms.

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These financial supports are gratefully acknowledged since they were essential for the success of the meeting. They covered the local expenses of the invited speakers, and the attendance of a significant numbers of young scientists and colleagues from Eastern Europe, who could be assisted by fellowships and reduced registration fees.

Eventually, the Organizing Committee is grateful to Zeitschrift für Naturforschung for publishing the Proceedings as a special issue.

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