

# International Workshop on the Mode of Action of Herbicides in Photosynthesis

Wageningen, The Netherlands, August 8–9, 1983

## – Preface –

Z. Naturforsch. **39 c**, 327–328 (1984)

Herbicides play an important role in Western agriculture and demand for them is increasing. They are aimed at specifically interfering with plant metabolism, thus increasing security that toxicity to mammals and man is minimized. However, herbicidal activity is generally found by screening tests in the greenhouse with comparatively little emphasis on research on mode of action. Detailed knowledge of herbicide-target interactions, however, will allow to establish reliable structure/activity relationships which, in turn, will bring us closer to a “chemical design” of new phytotoxic compounds with predictable properties. Furthermore, basic herbicide research will put into use new inhibitors, thus contributing to general plant physiology and biochemistry. Investigations of the complexity of plant life need analysis by the specific interference of certain single processes, in order to evaluate their significance. As a matter of fact, all of this herbicide research depends on interaction between industry and university and the Workshop was intended to promote these contacts.

Many herbicides being developed or already commercially introduced are directed against the photosynthetic apparatus, *i.e.* the electron-transport, pigment and thylakoid-membrane system. The Workshop was devoted to discussion of such inhibitors and followed a similar one held in Konstanz four years ago (see Z. Naturforsch. **34 c**, issue no. 11, 1979).

13 Talks were given and 37 posters presented, while the audience consisted of about 70 participants coming from European universities and chemical companies. Three main subjects were covered:

First, the photosynthetic electron-transport inhibitors, *i.e.* compounds which directly inhibit electron flow immediately after having reached their

reaction site at the thylakoid. This is the region between the photosystems either at the Q<sub>B</sub>-protein (a 32 to 33-kilodalton thylakoid peptide), at adjacent peptides, and the FeS-cytochrome-*f/b*<sub>6</sub> complex. Most of the contributions dealt with studies on effects at the Q<sub>B</sub>-site, which have been impressively advanced in the last three to four years, markedly stimulated by herbicide-resistant mutants which became available from higher plants and microalgae. Evidence is accumulating to show that the Q<sub>B</sub>-protein contains a redox-active plastoquinone which may be (reversibly) replaced by herbicidal compounds of different chemical structure.

The second topic dealt with bleaching activity of compounds which affect biosynthesis of carotenoids. All these agents – as known so far – exert their essential phytotoxic effect by inhibiting desaturation of phytoene, a precursor of  $\beta$ -carotene and xanthophylls. In contrast to electron-transport inhibitors, symptoms develop during growth. Accordingly, these can be advantageously studied and quantified by administering sublethal herbicide concentrations to model-assay systems, like liquid algae or cell-suspension cultures. New bleaching compounds were presented in addition to cell-free preparations which have been developed recently. These allow for enzymological target-inhibitor studies without problems caused by permeation or metabolic breakdown as they may be found in cellular assay systems.

The third subject was related to herbicide-induced breakdown of chloroplast constituents through radical formation and/or activated oxygen leading to lipid peroxidation. Diphenyl ethers and bipyridyls are most prominent representatives, exhibiting strictly light-dependent peroxidative activity, although their mode of action is different. Some presentations dealt with the effects of xenobiotics on other plant processes, like ammonia assimilation or chloroplast biogenesis.

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All contributions had to be condensed. However, some laboratories chose to pool separate presentations into one paper to which more printing space was allotted.

#### The Organizers

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