



Effect of Herbal Extracts and Plant Growth Regulators on Photosynthetic Pigments of Soybean Under Waterlogged Condition

KEYWORDS

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ABSTRACT The effect of composite herbal extracts Ultrasil 0.3%, Ultra K 0.2% and plant growth regulators such as - amino butyric acid (GABA), putresine and biotonic in 0.1% concentration on photosynthetic pigments i.e. Chlorophyll (a and b) and carotenoids was determined in field experiments conducted during 2012-2013. Foliar application of PGRs and herbal extracts promoted photosynthetic pigments in both normal and waterlogged condition. The application of growth stimulants improves the photosynthetic efficiency of the oil yielding pulse crop soybean. Thus these growth regulators ameliorates the adverse effects of waterlogging leading to the improvement in the overall performance in field condition.

Introduction:

Soybean is an important pulse crop belonging to family Fabaceae. It possesses very high nutritional value. The world production of edible oil contains about 30.3% of soybean (Amihullah et al., 2000). It is widely cultivated in the tropics, subtropics and temperate zones of the world. Waterlogging adversely affected the leaf metabolism. Zvareva and Bartkove (1976) reported that waterlogging not only reduces the rate of photosynthesis but also reduced the rate of translocation of photosynthetic products of soybean. Pezeshki (1994) stated that anaerobic condition causes adverse effects on chlorosis, reduced growth rate, cell membrane disruptions adverse effects on mineral uptake, stomatal closure, leaf wilting, wilting and epinasty, reduced photosynthesis and respiration, altered carbohydrate partitioning and potentially death in soybean.

Plant growth regulators are organic compounds, which are synthesized in very small quantity in plants and play important role during seed germination, growth and developments of plants. Soybean is a multiduty pulse crop, utilized for oil, soya milk, forage crop, bakery products, etc. It is sensitive to environmental change. Thus it thought worthwhile to study the influence of PGRs on soybean under waterlogged condition.

Materials and Method:

The present study was conducted in the field of Botany at Shivaji University, Kolhapur. Seeds of soybean (Variety JS-335) were sown in the twelve pots with two replications (first 6 with normal irrigation and other 6 with water logging stress). The seeds were allowed to grow for 20 days with equal irrigation of tap water in both the replications. First spray was given at 21st day with 0.3% ultrasil (*Adhatoda vasaka*, *Cardiospermum halicacabum*, *Embelia ribes* and Aqua solvent), UltraK 0.2% (*Adhatoda vasaka*, *Cantharus tinriust*, *Embelia ribes* and Aqua solvent) and PGR such as 0.1% GABA, Putrescine 0.1% and 0.1% Biotonic (Cystein Methionine, Lysine, Valine, ABA, Nicotinic acid, vitamin Riboflavin, Saccharides (Myoinositol), Cytokinenine (6 BA) and BSA) respectively to the each pot of normal & waterlogged stress. The same sprays were repeated on 35th day/ flowering stage. After 2nd spray water logging stress condition applied for 6 days to the second replication (6 spots) and at 7th day stress was removed. The in-

fluence of foliar application of Ultrasil (0.3%), UltraK (0.2%) and 0.1% GABA, Putresine, Biotonic on photosynthetic pigments of soybean were studied separately for normal irrigated and stress pots. Chlorophyll content determined in fresh leaves as mg/100g fresh weight according to the procedure described by Arnon (1949).

Result and Discussion:

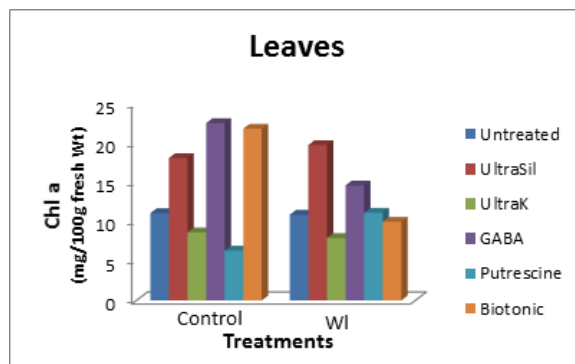


Fig. 1 Effect of foliar application of herbal extracts and plant growth regulators on the chlorophyll a content in leaves of *Glycine max L. Merrill* grown under unstressed and waterlogging stress.

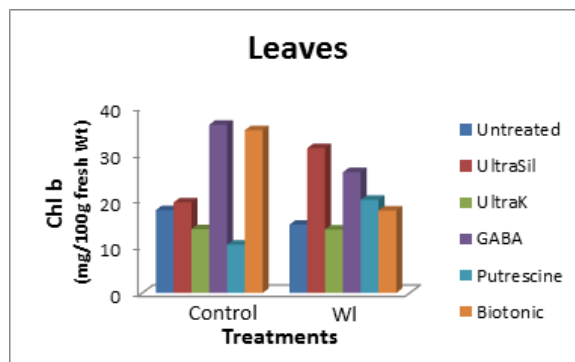


Fig. 2 Effect of foliar application of herbal extracts and plant growth regulators on the chlorophyll b content in leaves of *Glycine max L. Merrill* grown under un-

stressed and waterlogging stress.

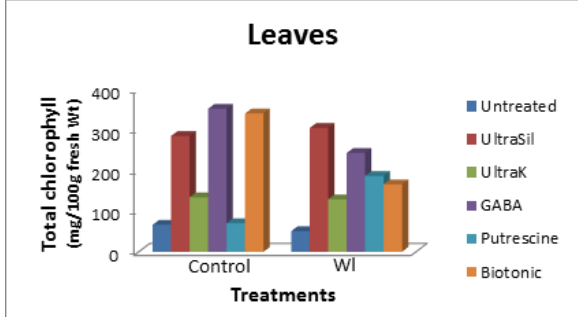


Fig. 4 Effect of foliar application of herbal extracts and plant growth regulators on the Total chlorophyll content in leaves of *Glycine max* L. Merrill grown under unstressed and waterlogging stress.

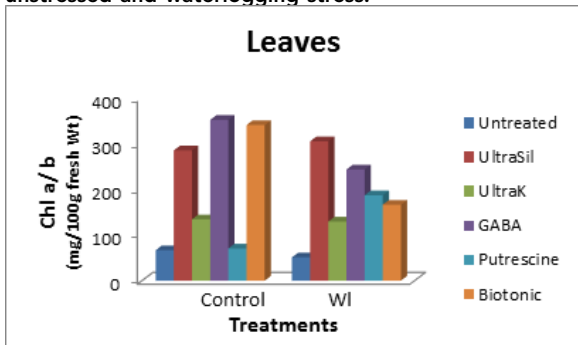


Fig. 4 Effect of foliar application of herbal extracts and plant growth regulators on the chl a/ chl b ratio in leaves of *Glycine max* L. Merrill grown under unstressed and waterlogging stress.

According to Fig. 1, 2 and 3; it was found that during normal irrigation and stressed condition foliar application of herbal extracts Ultrasil, and PGRs such as GABA, Purisine, Biotonic (0.1%) resulted in increase in chlorophyll a, b and total chlorophyll content. From Fig. 4 the chl a/ chl b ratio significantly increased in ultrasil treated soybean plants under both unstressed and waterlogged conditions.

Besford et al (1993) reported that Putrescine and other polyamines stabilized thylakoid membrane complexes. El-Bassiouny et al., (2008) showed that putrescine (5mM) increases photosynthetic pigments of wheat plants. Sorte et al., (1996) showed that in soybean 4 and 8 day waterlogging causes decrease in chlorophyll content. According to Islam et al., (2010) application of 1mg/L GABA shows increase in total chlorophyll content in *Vigna mungo*. Linkermer et al., (1998) studied that due to waterlogging growth rates reduced and lower grain yield in soybean and attributed to a decline in net photosynthesis and leaf expansion.

An increase in chlorophyll content due to foliar application of herbal extracts and PGRs would help to improve the photosynthetic efficiency. The soybean is waterlogging sensitive crop; so the application of PGRs and herbal extracts may prove beneficial for improvement of growth and productivity economically in oil yielding soybean.

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