

Institute of Plant Physiology (IPP) - 404**Executive Summary**

IPP is a very good Institute in the field of plant sciences in Bulgaria, and an internationally visible and competitive research unit (Quality/Productivity score A). Researchers from the IPP target scientific questions, which are highly relevant in terms of scientific and socio-economic impact, and are included in priorities of BAS and Framework Programmes of the EU (Socio-economic Impact score A). The capacity of fund raising, and attraction of students and future researchers appear to be moderate, and the plans for future developments may not be sufficient to revert these trends. Overall, the Institute's prospects are moderate (Prospects score B).

Overall Strengths:

The potential of IPP for basic and applied research is very high and the scientific output of the IPP is among the best five of the life science institutes belonging to BAS. The Institute has clear views of their strengths, as well as the problems they face, which is an important step in planning for the future.

Overall Weaknesses:

Although the Institute has successfully recruited young researchers, only a few scientists are in the age group of 41 to 55 years. This might create problems in the mid-term future as regards maintaining and further improving the Institute's current scientific output. Plans for future scientific developments are often too general and lack a clear focus. This situation is partly due to the unpredictable granting situation in Bulgaria and the large competition for basic research oriented funds in the European system.

Specific Panel recommendations:

The Panel recommends raising the quality of the Institute's journal (*General and Applied Plant Physiology*) in order to be accepted as SCI journal with impact factor. The Institute should work out clearer scientific directions for the future, concentrate its efforts on important topics and decrease its involvement in the large number of diverse projects, which often receive minor funding. The Panel recommends that IPP works on improving its infrastructure to be able to increase further the already high value of the research that has been carried out in the past. Furthermore, with a well operating infrastructure the Institute could serve as reference centre for training and transfer of knowledge in Bulgaria. Efforts should also be made to improve transfer of basic scientific knowledge to practical applications, in order to enhance the fund-raising capacity of researchers. The website should be modernized and regularly up-dated with both general and scientific information to improve the attractiveness and visibility of the Institute.

Evaluation Summary

IPP is one of the oldest biological institutes of the Bulgarian Academy of Sciences. It has currently 119 employees, among which are 51 scientists and 68 research supporting staff, including 51 individuals with university degree. The qualification of the scientists is high, with over 90 % holding a PhD or DSC degree. However, when all research personnel with University degree is concerned the ratio of PhD holders is only 40 %. The scientific work of IPP is organized into five departments: Experimental algology, Photosynthesis, Plant mineral nutrition and water relations, Plant stress molecular biology, Regulation of plant growth and development.

(a) Quality and Productivity

Quality

Strengths:

The Institute as a whole is clearly visible internationally, and the recognition of its researchers' activities is very good. During the reporting period of 2004-2008, 1773 citations appeared, of which 1351 are listed by the Web of Science database, whereas the rest (23 % of all) is in non-SCI publications. According to the Web of Science statistics, the number of citations has been gradually increasing over the last 15 years from 50 citations/year in 1990 to 300 citations/year in 2008. The Institute has published two papers that received over 100 citations in total, and the Hirsh index of the total output of the Institute since 1976 has been 24. These figures are very good at the Bulgarian level, and good at the international level, considering the size of the IPP.

The selected best ten publications are in good and top quality journals in the field, with a cumulative impact factor (IF) of 69. The IPP authors act as first author in 70 % of the selected publications, highlighting their important and significant contribution to the work.

Some of the researchers are personally well known at an international level and have a noteworthy citation level (>500), indicating that their research has a considerable impact on the international community. Some original and innovative fields of research have been initiated like the study of secondary metabolites and the investigation of transcriptomics during developmental processes. These studies are potentially suitable for applications such as improving plant productivity, resistance to stresses, and adaptation to climate change.

Weaknesses:

A weakness is the relatively high number of publications in lower impact journals, which results in ca. 1.5 IF per international publication. Although this figure is good in comparison with other life science Institutes of BAS, it reflects the difficulties the Institute faces in targeting the higher impact journals in the plant physiology field.

Productivity

Strength:

IPP's researchers published actively during the reporting period (2004-2008) as illustrated by the total number of publications, with 166 papers published abroad (133 of them in SCI journals), and 133 papers in scientific journals in Bulgaria. This can be further broken up in 2,63 publication per researcher in five years or 0,53 publications per researcher per year. This is relatively low according to international standards, but among the best results if compared to the scores of other BAS Institutes active in plant biology. This Institute has clearly a high scientific productivity, mostly deriving from international collaborations with very good laboratories and research centres.

Weakness:

A weakness regarding scientific output is the relatively high proportion of papers in Bulgarian journals, which have no impact factor and/or are not visible via internet accessible public databases, and therefore have little impact on the international scientific community. The contribution of the five departments to the scientific output in terms of high quality publications is rather uneven, with Departments of Photosynthesis, Plant Mineral Nutrition and Water Relations being the main contributors.

Overall score for Quality and Productivity: "A" for *"work that is internationally competitive. The Institute has demonstrated important contributions to the field and is considered an international player."*

(b) Socio-economic Impact

IPP's research targets important questions of plant physiology, which are at the forefront of the current international research (e.g., role of volatile compounds, mechanisms of plant stress tolerance, role of reactive oxygen species). An important socio-economic aspect of the Institute's activities is the education of graduate students and the training of highly qualified scientists. The research performed has a high innovation potential, for example, regarding the improvement of stress tolerance and productivity of agronomically important plants, utilization of large scale alga cultures. However, in the reporting period no patents were obtained. Although IBP has many bilateral international cooperation projects their participation in collaborative EU projects is so far limited.

Overall score for Socio-economic Impact: B - "Moderately Relevant".

(c) Prospects

Strengths:

The Institute plans to develop research in the fields of biodiversity and climate change, biotechnology and agrobiological. As for other BAS Institutes, it appears that planning of current and future work is difficult, due to the large dependence on external funding. The productivity of the IPP was stable during the reporting period,

accompanied with a steeply increasing international recognition, as shown by the dynamics of recent citations. Thus the Institute has a solid background for the successful completion of research planned for the coming years as far as the expertise and scientific background is concerned. Importantly, the Institute has recognized its problems with the ageing scientific personnel, and has already successfully recruited young scientists. The IPP has also presented to the Panel a balanced SWOT analysis of its current situation and future prospects, which will help to shape its future activities.

Weaknesses:

The ability of the Institute to attract funding from sources outside the BAS and NSF is very low. It had no support from government, other Bulgarian agencies, or industry. Support from foreign sources (EU) was also rather limited. This situation should be improved in the future if the IPP wants to remain competitive at the international level.

Overall score for Prospects: B - “Moderate”.

Overall Strengths and Weaknesses

Strengths:

The IPP is an important national player and at the same time an internationally visible and competitive research unit in the field of plant sciences. The potential of IPP for basic and applied research is very high and the scientific output of the IPP is among the best five life science institutes belonging to BAS. The leadership of the Institute has clear views of IPP's strengths, as well as the problems it faces, which is an important step in planning for the future.

Weaknesses:

Research is fragmented into many small projects due to the fact that the Institute depends mainly on NSF funding, which has been low. Plans for future scientific developments are often too general and also lack clear focus. This situation is partly due to the unpredictable granting situation in Bulgaria, and the large competition for basic research oriented funds in the European system. Although the Institute has been successful in recruiting young researchers, only a few scientists are in the age group of 41 to 55 years. This might create problems in the mid-term future as regards maintaining and further developing the Institute's current scientific output. The Institute seems to have difficulties in attracting research support from Bulgaria (other than from BAS) and abroad.

Recommendations

- *General Panel recommendations are listed in the Panel Level Report.*

Specific Panel recommendations:

- It is advised to raise the quality of the Institute's journal (*General and Applied Plant Physiology*) in order to be accepted as SCI journal with impact factor.
- The Institute should work out clearer scientific directions for the future, concentrate its efforts on important topics and decrease its involvement in the large number of diverse projects, which often receive minor funding.
- The Panel recommends that IPP works on improving its infrastructure to be able to increase further the already high value of the research that has been carried out in the past. Furthermore, with a well operating infrastructure the Institute could serve as reference centre for training and transfer of knowledge in Bulgaria.
- Efforts should also be made to improve transfer of basic scientific knowledge to practical applications, in order to enhance the fund-raising capacity of researchers.
- The website should be modernized and regularly up-dated with both general and scientific information to improve the attractiveness and visibility of the Institute.