Research findings

IV IPI Satellite Colloquium of the 11th Chinese Soil Congress on "Potassium in Sustainable Development of Chinese Agriculture", 26 September 2008, Beijing, China

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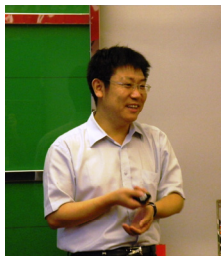
Organizers of the Satellite Colloquium from the Institute of Soil Science, Chinese Academy of Sciences in Nanjing (ISSAS, CAS), Chinese Agricultural University (CAU) and the International Potash Institute (IPI).

The colloquium was organized by the International Potash Institute (IPI) and IPI collaborators in China. Prof. Dr. Jianmin Zhou, Chairman of Chinese Soil Congress, and Mr. Hillel Magen, Director of IPI, chaired the meeting. Nine presentations were given covering various aspects of potassium use in agriculture, which attracted a good number of scientists to the meeting.

Prof. Fu Chen from the Chinese Agricultural University (CAU) presented a lecture on "Food security and efficient use of resources in China – challenges for the future". The total crop yield (TCY) of China ranges between 450 and 510 million mt per year, which accounts for 95 per cent of China's food needs. But during recent years the crop yields per area studied have hardly increased, and the increase in TCY has been mainly achieved through an increase in cropping intensity. The Chinese government plans to gradually increase the TCY to achieve 540 million mt by 2020. The main strategies to reach this target - improving soil fertility and overcoming the crop-growing limitations in low-production land - are required, without adding more inputs on the high-production land.

Prof. Dr. Fang Chen (International Plant Nutrition Institute; IPNI, China) discussed the topic of changes in crop responses to potassium fertilizer in China. Before the 1970s, application of potassium had no effect on crop yields in most regions of China. At the beginning of the 1980s, using potassium evidently increased crop yields in the southern part of the country and in some areas in the north. From 2001-2007, the increment in crop yield generated by one unit of potassium increased by 150-450 per cent compared with the increment produced by one unit of potassium in the 1980s.

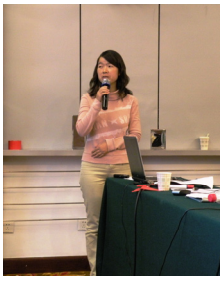


Dr. Youguo Tian (National Agro-Technical and Extension Service, Beijing) described soil potassium (K) status in the main croplands of China. Results from a 24-year national survey of soil monitoring sites indicates that the change in soil available K fluctuated with time and differed in different regions of China. In general, K content at the soil sites remained stable and showed a tendency to increase during 1985 to 2007. This is different from results that have appeared in much Chinese published research, which show that the available K content in most cropland investigated decreased significantly compared with values obtained 20 years ago. However, recent results of soil K balance suggest that soils of most monitoring sites suffer from depletion of K.

Dr. Huoyan Wang from the Institute of Soil Science, Chinese Academy of Sciences in Nanjing (ISSAS, CAS) introduced some advances in soil potassium research that his workgroup have recently achieved. The results showed that soil non-exchangeable K could be distinctly differentiated from crystal K, and the content of soil non-exchangeable K ranged from 20 to 55 per cent of total K in soils. The easily-releasable non-exchangeable K plays an important role for plant K uptake. He concluded that a good method for measuring soil available K must take the easily-releasable non-exchangeable K into account.

Research findings

Dr. Weifeng Zhang from the Chinese Agricultural University (CAU), Beijing, introduced the potassium fertilizer demand by crops and the driving forces for its consumption in China. Most Chinese farmers have little awareness or reliance on potassium fertilizers, which leads to inconsistency in its use. Soil fertility and crop yield are the main factors affecting effectiveness of K fertilizer. Consumption of K fertilizers will depend on crop yields, price of K fertilizer and the profit farmers can achieve through its application. The need to improve the supply and management of K fertilizer to achieve higher crop yields are the main issues to be addressed in future.



Dr. Xiaoqin Chen from the Institute of Soil Science, Chinese Academy of Sciences in Nanjing (ISSAS, CAS) summarized the results from an IPI project in south China, which has conducted 43 field experiments in six provinces (Henan, Anhui, Hubei, Hunan, Guangxi and Sichuan). It demonstrated that a good ratio between N and K fertilizers is important for improving N and K fertilizer use efficiency in the south-central part of China. The fertilizer treatment with N/K ratio lower than one was better for N, K fertilizer use efficiency and value cost ratio (VCR) compared with treatments that have an N/K ratio higher than one for wheat, oilseed rape, maize, rice and sugarcane in , indicating that more K fertilizer is needed to improve both N and K fertilizer use efficiency.

Dr. Junfang Niu from the Institute of Genetics and Developmental Biology, Chinese Academy of Sciences, Beijing (CAS), introduced the results of the IPI north China project, which focused on the optimal K fertilization for different crops under different cultivation practices. Twenty-five field experiments were conduced in four provinces (Hebei, Shandong, Heilongjiang and Jilin). Obvious yield responses to K fertilization were shown in staple crops in north China such as maize, wheat, and soybean. Increases in crop yields were higher in high-yielding cultivation practices than those regularly used by farmers. K fertilizer application on three crops in north China increased the utilization efficiency of nitrogen and phosphorus, but lowered potash fertilizer use efficiency.

Dr. Uri Yermiyahu from Gilat Experimental Station, Volcani Center, Ministry of Agriculture, Israel, demonstrated that potassium status can influence the tolerance to environmental stress-causing agents via quality and plant health parameters, even when vegetative growth rates are not affected. The report shows that increasing K levels increased tolerance of olive trees to drought, reduced susceptibility of carnations to frost damage and reduced sodium (Na) concentration in olives leaves and rust in tomatoes resulting from irrigation with saline water.

Dr. Menachem Assaraf, IPI Coordinator for India and China, gave a presentation on the "Effect of potassium on plant tolerance to diseases caused by plant parasitic nematodes and weeds", which proposed a description of the relationship between plant nutrition and plant protection – a reviving theme. He concluded that balanced and optimized plant nutrition with K is likely to decrease the usage and dependency on pesticides, and serve as an essential component of Integrated Pest Management (IPM), and contribute to more sustainable agriculture. He also suggested that additional collaborative research, with plant pathologists, is required to further determine adequate/ balanced K rates and application times, to optimize plant K utilization, and subsequently to optimize plant health, crop yield and quality.

Prof. Fusuo Zhang, from the Chinese Agricultural University (CAU), Beijing, summarized the colloquium and noted that soil potassium research is gaining importance as the deficiency of K resources in China becomes more serious, particularly with the added concerns over the rapid rise in potash prices in 2008. Recommendations will be made to the Chinese government to increase funding of soil potassium research. Prof. Fusuo also recommended establishing a soil potassium research network or platform to attract a greater number of young scientists involved in this important area. ■