MEETING REPORT

A step towards increasing garlic productivity*

Garlic is one of the important bulb crops grown and used as a spice or a condiment throughout India. It is mainly used for flavouring and seasoning vegetables and meat dishes. It also has several medicinal properties. Garlic preparations are given in whooping cough and other lung diseases and stomach disorders. It is used specifically for the treatment of sore eyes and earache. It is also used for lowering cholesterol and blood pressure. It has an influence on platelet aggregation, an important factor in cardiovascular disease. It is also helpful in preventing cancer.

Garlic is grown worldwide in 14.65 lakh ha, with a total production of 248.37 lakh tonnes and productivity of 16.94 tonnes/ha according to FAO Year 2012. China is the world leader in area (8.50 lakh ha) as well as in production (200.00 lakh tonnes), followed by India (2.02 lakh ha and 11.50 lakh tonnes). Other major garlic-growing countries are the Republic of Korea, Egypt, Russian Federation, Bangladesh, Ethiopia, Myanmar, USA, Ukraine, Spain, Argentina, Brazil and Iran.

The productivity of garlic is highest in Uzbekistan (24.80 tonnes/ha), followed by Egypt (24.34 tonnes/ha), China (23.53 tonnes/ha), Kazakhstan (20.38 tonnes/ha), USA (18.66 tonnes/ha), Republic of Korea (11.99 tonnes/ha), Brazil (10.63 tonnes/ha) and Ethiopia (10.47 tonnes/ha). Although India holds second place in area and production, the productivity is very low 5.69 tonnes/ha according to FAO Year 2012.

India is projected to have a population of 1.7 billion by 2050, and there is no possibility of increase in cultivable land. To cater to the requirement of this ever-increasing population and keeping per capita consumption at the present rate of 4.0 g/person/day and 87.5% population consumes garlic (above 5 years age group) and export requirement increases to 3.0 lakh tonnes, processing 2.5 lakh tonnes and seed bulbs 1.50 lakh tonnes and losses in storage 4.50 lakh tonnes (15%), then total requirement during 2050 will be around 30.0 lakh tonnes. To achieve this target average productivity per hectare needs to be increased to 10 tonnes/ha compared with the existing productivity of around 5.20 tonnes/ha and storage losses need to be reduced to some extent.

A brainstorming session on 'Crop improvement, production technology, seed production and processing of garlic' was inaugurated by N. K. Krishna Kumar (ICAR, New Delhi). More than 25 scientists working in research and development of garlic from across the country representing various institutions and agricultural universities, as well as, private food-processing companies attended the session. Krishna Kumar spoke about the importance of garlic use in daily life due to its medicinal properties. The low productivity of garlic in India is one of the major issues of concern. Though there are many reasons for low yield, including short day length conditions available in India, sub-optimal standards of cultivation, weather vagaries and non-availability of virus-free quality planting material and use of local low-yielding varieties are also important. Krishna Kumar also took stock of the present status of production, research achievements, technology adoption by farmers and future requirement of garlic keeping in view the greater awareness about garlic cultivation and its importance, especially medicinal and nutritional properties.

He stressed on the need to augment garlic productivity through genetic improvement and supply of virus-free planting material, besides reducing storage losses.

Eleven lead lectures were delivered followed by open discussion. The deliberations were under two themes: (i) crop improvement and production technology, and (ii) seed production, protection and processing. The open discussion that followed reviewed the present status of garlic varieties cultivated in India under short-day and long-day conditions and the availability of virus-free quality planting material to improve productivity.

The brain storming session recommended several future courses of action to increase the production, productivity and quality of garlic. Garlic improvement research should be accelerated for developing high-yielding, allicin-rich clones through creation of heritable variation by induction of flowering and conventional-cum-molecular breeding/ inter-specific hybridization/somaclonal variation/bulbils exploitation. Technology for developing virus-free garlic through meristem tip culture, hardening, establishment, identifying virus-free areas for multiplication and to scale-up the protocol for commercial propagation need to be addressed. Collaborations with private companies should be explored.

The session also suggested working on garlic genomics and molecular markers for germplasm characterization and identification of duplicates. Exploration trips for collection of flowering garlic accessions from Central Asian and Himalayan regions need to be carried out on priority basis.

The session also recommended a study of intensive multilayered garlic seed production under polyhouse using LED and carrying populations from G1 to G4 for comparing yield advantage. The session further suggested that organic garlic production and its impact on quality need to be explored. Studies on the effect of sulphur, boron, calcium and magnesium on garlic quality are needed. Chemical profiling of garlic accessions and great headed garlic should be done. Long-day garlic in Northeast Himalaya and cold arid regions should be popularized for augmenting production for local supply and export. Experiments need to be initiated for protected cultivation of garlic for higher productivity.

The session suggested that thermo cryotherapy should be promoted in a big way for lessening viral disease problems in garlic and need for establishment of core collection of cryopreserved and virus-eliminated garlic in India. Emphasis was made on the need for eco-friendly plant protection technologies to be evaluated with available bio-pesticidal

*A report on the brain storming session on 'Crop improvement, production technology, seed production and processing of garlic' held at the National Horticultural Research and Development Foundation, Nasik on 29 November 2014.

formulations as garlic food safety is of prime importance. Development of bigger clove garlic varieties with high resistance to toxic shock syndrome (TSS suitable) for processing industries is the need of the hour. Varieties with low reducing sugars, thereby avoiding yellowing in processed garlic also need to be developed.

It was also suggested that farmer-friendly nutrient, pest and disease symptoms chart along with control measures should be developed. Gene chip technology (micro array) should be developed for identification of all pathogens, including virus/fungus. The garlic sample from different states should be collected for the study of pesticide residues in terms of food safety measures. The mechanization in garlic by pelleting of garlic clove may be tested through collaborative work. Krishna Kumar also suggested that the brain storming session on garlic should be organized once in every three years and review of the previous year's recommendations must be made. The strategies suggested can boost production, productivity and quality of garlic in the country.

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MEETING REPORT

SERB School in neuroscience*

The VIII SERB School in Neuroscience was recently organized with a view to provide insights into some of the cutting-edge areas in neurosciences. Twenty-four participants, including undergraduates, Ph D scholars, postdoctoral fellows and young faculty members from diverse disciplines participated in the course. Twenty-seven faculty members with expertise in research and teaching skills, from India and abroad, were invited to deliver pedagogical talks and share their excitement in science.

The School began with lectures on fundamental aspects and rapidly took the participants to challenging depths. Starting with an introduction to the brain, the participants learnt about the electrical properties of neurons and synaptic transmission, axonal transport and neuronal tracing, and synaptic and neural plasticity. They also learnt about the development of neuronal connectivity, the molecular mechanisms governing neuronal regeneration and functioning of circadian clocks. Recent concepts in sensory perception were explored in minute details. The fascinating story of the evolution of the limbic system vis-à-vis emotional behaviours was another highlight. Participants were also introduced to the concept of central pattern generation and its underlying computational logic. Additionally, they learnt about the recent concepts in memory formation and reorganization of neural circuits. Computational neuroscience is an emerging area and provides enormous scope to the students with interdisciplinary skills. There were extensive sessions in this area.

The most exciting component was the hands-on sessions ranging from wet-lab to computational strategies in brain circuit research. There was a demonstration of comparative neuroanatomy, and participants performed the techniques on neuronal tracings. The visualization locomotor behaviour under optogenetic control was a particular highlight. Electrical circuit design and action potential simulations were used to explore concepts in electrophysiology, and electrical activity was recorded from the locust antennal lobe. Extracellular multichannel recording from behaving animals was also demonstrated. The computational sessions involved the use of various computational tools like the NEURON and M-Cell packages and analysis of neuronal processing as dynamical systems.

The School included a grant proposal writing exercise, wherein the participants were divided into groups and were expected to work on a novel research idea and write a grant proposal. The groups defended their proposal in front of a review committee composed of professors. This was a great opportunity to collaborate with fellow participants from diverse disciplines. Additionally, there was a poster session where participants presented a paper unrelated to their research interests. These activities fed into another measure of the School's success – passionate, freewheeling discussions between students and scientists over lunch and dinner.

A unique attraction of the School was the evening research lectures where one could hear first hand how the concepts and techniques discussed in pedagogical lectures were applied to generate new knowledge.

In retrospect, the School not only exposed the participants to different areas of research in neuroscience, but also provided them with insights into experimental strategies and analytical techniques that could be implemented in their own research. The opportunity to interact with dedicated experts and like-minded individuals from across the country and globe was invaluable. The SERB School in Neuroscience is an ideal platform for initiating young researchers into neuroscience and encouraging collaborative interdisciplinary research. While SERB, Department of Science & Technology, Government of India supported the School, IISER Pune was a perfect host. We hope the School continues to inspire young minds, thus catalysing neuroscience research.

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