

Pradesh University, Shimla) talked about mushroom biotechnology. He said that there are around 2000 species of mushrooms which are reported to be edible from all over the world. About 350 have also been reported from India. Of these, cultivation technology has been developed for around 25 species. But only button mushrooms, oyster mushrooms, Japanese shiitake, jelly fungus and milky mushrooms are being cultivated on commercial scale. Button and oyster mushrooms and shiitake occupy the top place regarding production. The technology for their cultivation has been standardized and modified from time to time according to the needs. Different types of substrates have been tried

to make it an economically feasible venture. He discussed in detail the cultivation technology of a few mushrooms so that it can become a household activity throughout the country. Not only does it provide good nutrition, but is also a profitable economic activity. Meera Pandey (Indian Institute of Horticultural Research, Bangalore) spoke on 'Many facets of mushrooms'. According to her, mushroom culture is a biotechnological process which recycles ligninocellulosic wastes that can be converted to protein-rich food source (edible mushrooms), important source of many medicinal products (medicinal mushrooms), bioremediation (all basidiomycetes), lignocellulosic

degradation (white and brown rot basidiomycetes), for organic manure production, cattle feed and as a source for bioagent multiplication (mushroom spent substrate). India produces about 306.6 million tonnes of crop residue per annum. About 70% of the crop residue is burnt in the fields. This huge availability of crop residue and cheap labour are reason enough to have an efficient mushroom production programme, she added.

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MEETING REPORT

Guava symposium*

Ashok Bajpai, Honourable Minister of Agriculture, Government of Uttar Pradesh, inaugurated the opening sessions of the First International Guava Symposium at Lucknow. In his opening remarks, he appreciated the efforts of the Central Institute for Subtropical Horticulture, Lucknow and welcomed the delegates from India and abroad.

About 200 delegates participated in the symposium. The scientists who participated from abroad represented Israel, France, Malaysia, Mexico, Venezuela, Germany, South Africa and USA. The deliberations of the symposium were divided into ten technical sessions, viz. current scenario in the guava industry, genetic resources and varietal improvement, biotechnology, integrated production system, organic farming, nutrient and water

management, integrated management of pests, integrated management of diseases, post-harvest technology and value addition, and transfer of technology and government programmes for guava development for domestic and export marketing.

G. Kalloo (ICAR) delivered a lead paper on global scenario of guava production, utilization and trade. The talk was mainly targetted on genetic resources and improvement, inter-specific hybridization, varieties, propagation planting density, pruning and rejuvenation. He also emphasized on researchable issues, particularly seedlessness, molecular breeding, gene tagging and genomics. The second presentation was by D. S. Rathore (HPKV, Palampur). He discussed the current status of propagation methods, micro-propagation, cropping pattern, planting density, training, pruning and leaf nutrient status.

During the second session on genetic resources and varietal improvement, S. S. Negi suggested the future line of work for widening the genetic base for effective breeding through inter-varietal hybridization involving less seeded triploid varieties with those of high yielding, better keeping quality and less seed content. He stated that emphasis should also be given to breed scion and rootstock separately for abiotic/biotic stress situations.

The variety TRY(G)1 of Tamil Nadu needs to be tried for diversification under sodic soil conditions.

The second day of the symposium, started with a technical session on biotechnology. There were three oral presentations during this session. The lead lecture was delivered by V. S. Jaiswal with emphasis on cryo-preservation, synthetic seed production, selection to screen salt-tolerant varieties as well as somatic embryogenesis for rapid plant multiplication. R. Chandra dealt with the need to engineer genes controlling ethylene biosynthesis for better shelf-life and insertion of genes encoding hydrolytic enzymes, viz. chitinase and glucanase for controlling fungal disease of guava. Rohde gave a detailed account for molecular characterization of 62 Cuban guava germplasm using AFLP and microsatellite DNA markers.

In the session on integrated production system, two papers were presented on forecasting harvest using spectral indices leaf-to-fruit ratio, rejuvenation and variation in fruit quality in relation to tree age and position on the tree. Fast multiplication of guava through wedge grafting, high-density plantation, canopy management and crop regulation was also emphasized by Gorakh Singh. The need to integrate

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organic farming systems prevalent in India to develop the Jaivik package of practices for guava production was detailed by R. K. Pathak.

During the session on nutrient and water management, there were two lead lectures. B. K. Singh presented a paper on water requirement of guava under drip and plastic mulch and reported that drip irrigation followed by plastic mulch produced highest yield (44.98 ha^{-1}). In the second presentation on spatial root activity pattern of guava, cv. Arka Mridula was studied in relation to age using ^{32}P radio isotopes. S. C. Kotur reported that the root activity in 7 and 16 years of age trees recorded more intensity of root activity during rainy season and declined in winter season.

Under the session integrated management of insects, the lead lecture was given by M. Mani on the status of biological control of guava pest in India. He stressed on the use of microbial pathogens, predators in conjunction with botanicals which has got ample scope owing to its cost-benefit ratio. A. Verghese spoke about IPM techniques for the major pests of guava. He stressed that basic ecological aspects with respect to sampling techniques should be taken care of in order to develop the viable IPM strategies in the region. Various attacks on guava and their control were outlined by different speakers. The Chairman, emphasized that eco-friendly methods of pest control, using botanicals, microbials and bio-agents should be encouraged in guava ecosystem. Precaution must be taken while transporting the plant material from South India to

North India and vice-versa to reduce the risk of spiralling white fly and stem borer insects.

In the third day, the first session was on integrated management of diseases. S. Kumar highlighted the interaction of causation of guava wilt disease by the spiral nematode *Helicotylenchus dihystra* and fungus *Fusarium oxysporum*. He suggested that management should aim at controlling the fungus and nematode. A. K. Misra isolated and identified the fungus *Gliocladium roseum*, seems to be the main causal organism for guava wilt. However, the intensity of fungus can be controlled using AN 17 strain of *Aspergillus niger* along with *Trichoderma harizanum* and *Penicillium citrinum*, as well as intercropping of *Curcuma domestica*, by way of restricting the trees to basin infection and avoidance of tillage operation from July to November. Om Prakash reported two new diseases of guava, namely *Botryospheria* fruit rot and *Hyaloderma* leaf spot. He also noted that *Streptosporangium pseudovulgare* isolated from cow dung is highly effective in management of anthracnose disease of guava. The Chairman said in his concluding remarks that the causal organism of guava wilt should be confirmed using modern tools and major diseases need to be identified based on economic threshold levels.

The next session on post-harvest technology and value addition highlighted the importance of handling methods to enhance the shelf-life of fresh guava fruits. D. K. Tandon detailed the scope of value addition in guava. Concluding remarks

of the Chairman highlighted the establishment of appropriate non-destructive maturity indices as well as a protocol for export of fresh guava. Development of guava-based innovative processed products on consumer demand as well as protein-fortified fruit products should be encouraged, to avoid nutritional deficiency in human beings. R. K. Pal highlighted the control of post-harvest fruitfly disinfestations and delayed ripening in cvs Allahabad Safeda and L-49 by insecticidal controlled atmosphere storage containing 40% CO_2 + 1% O_2 for 12 h at 40°C or hot-water treatment at 49°C for 20 min or gamma radiation @0.25 kGy treatment of fruit.

The last session was on transfer of technology and government programmes for guava development for domestic and export marketing. There was one lead lecture by R. N. Padaria on participatory technology development and dissemination system for quality production and marketing of guava. Concluding remarks of the Chairman highlighted that emphasis should be given on farmer-scientist partnership, as well as discourage pre-harvest contracts. This should be made an integral part of the extension system to boost guava production, marketing and processing.

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