



### Contents

#### Research Highlights

- ❖ Yield and quality parameters of Dragon fruit lines
- ❖ Soilless Production Technology on Arka Fermented Cocopeat for Colour Cabbage
- ❖ Novel jackfruit selections with attractive coppery red flakes for homesteads
- ❖ Characterisation of Jack Fruit varieties
- ❖ Varieties identified at National Level
- ❖ Varieties identified at Institute Level
- ❖ Arka Yojith-white onion variety developed for dehydration
- ❖ Identification of self-compatible line in tuberose

#### News and Events

- ❖ Technical Review Meeting of KVK Hirehalli
- ❖ Visit of Parliamentary committee on Agriculture
- ❖ Exploration and collection of tamarind from Chhattisgarh
- ❖ National Conference on Horticultural Crops of Humid Tropics - Diversification for Sustainability
- ❖ Mango diversity exhibition
- ❖ World Environment Day
- ❖ Demonstration on composting of coffee husk
- ❖ Interface meeting on Avocado Grading and Marketing
- ❖ International Yoga Day
- ❖ Jack fruit diversity fair
- ❖ XXXV Group meeting of AICRP on Vegetable Crops
- ❖ Review of TSP activities and Input distribution programme
- ❖ Seminar on Black pepper

#### Transfer of Technology

#### Distinguished visitors

#### Personalia



### IN FOCUS

### Scope of Semiochemicals for Eco-friendly Management of Horticultural Crop Pests

Semiochemicals (behaviour modifying chemicals) are used by insects to interact with their environment for survival and reproduction. In other words, insects use chemical cues for identifying suitable mates (=pheromones) and host plants (= kairomones). Insects' reliance on these chemical cues offer a number of opportunities for their management. Insect pests of horticultural crops are evolving rapidly with changing climatic conditions, monocropping and constant selection pressure that is being exerted by intensive insecticidal applications. Semiochemicals are increasingly being used as important component of integrated pest management (IPM) strategies for a number of insect pests worldwide.

Push-Pull strategies or Stimulo-Deterrent Diversionary strategies (SDDS) uses repellent/deterrent (Push) or attractant/ stimulant (Pull) to direct the movement of insect pest or natural enemies for eco-friendly pest management. Nevertheless, semiochemicals have been less exploited so far to control horticultural crop pests. This may be mainly due to lack of thorough understanding of chemical mediated processes or chemical ecology of target insect pests. Therefore, the development of reliable, robust and sustainable push-pull strategies require a clear understanding of behavior and chemical ecology of insect pests, its interactions with their host plants, conspecifics and natural enemies in order to underpin key processes that can be exploited as weak links for their management.

ICAR-IIHR, has been in the forefront in exploring semiochemical based IPM strategies for major horticultural crop pests. At present, in India, the focal insect pest species where semiochemicals played a major role in IPM programs is largely confined to tephritid fruit flies through male annihilation technique (MAT) in mango as well as other fruit crops like guava, custard apple, citrus etc. The discovery of methyl eugenol (ME) as male attractant of several *Bactrocera* spp viz., *B. dorsalis*, *B. correcta*, *B. zonata* by Frank Milburn Howlett in 1912 at former Imperial Agricultural Institute of Pusa, Bihar (now Indian Agricultural Research Institute, New Delhi) revolutionized the monitoring and management of fruit flies all over the world. In India, the consistent collaborative research efforts of ICAR-IIHR and DFID, UK led to commercial availability of fruit fly traps to farmers. A patented process (1068/CHE/2010) developed by ICAR-IIHR is used in traps throughout the country for

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### Directors Desk

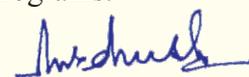


ICAR – IIHR has been in the forefront of understanding the role of semiochemicals (volatile signal mediating chemical cues) in strengthening our current IPM programs against major horticultural crop pests which are otherwise falling short of powerful eco-friendly components and make them sustainable in the long run. Semiochemicals are natural substances like pheromones, allomones, kairomones, attractants and repellents that are being produced and used by insects and plants for communication. However, except for handful of insects, semiochemicals are less investigated so far in horticultural crop pests in spite of their ability to strengthen our IPM programs. This may be mainly due to lack of thorough understanding of chemical mediated

processes or chemical ecology of target insect pests. Therefore, development of reliable, robust and sustainable push-pull strategies requires a clear understanding of insect pest behavior and its interactions with host plants, conspecifics and natural enemies in order to underpin weak links that can be exploited for their management.

Male annihilation technique in fruit flies is thoroughly researched out over the past few decades at ICAR-IIHR and technologies (methyl eugenol/ cue lure traps) to manage these noxious pests were made available to the farmers. Additionally, we are focusing on host plant derived kairomones (Arka Dorsalis F) to attract female fruit flies as trapping gravid females will result in more robust semiochemical based management. Intensified efforts to identify synergists to enhance traditional methyl eugenol traps led to formulation of multilure blend (Arka Bactro+) to attract more numbers of male fruit flies of *Bactrocera dorsalis* and *B. correcta*. These technological innovations will be made available to farming community following intellectual property protection procedures.

In its quest to harness the potential of semiochemicals for sustainable IPM programs, ICAR-IIHR, is in the process of exploring chemical ecology of horticultural pests and is hopeful of identifying potent semiochemical cues for strengthening our IPM programs for safe and increased horticultural crop production. In this direction, we established a full fledged semiochemical laboratory with state-of-art electrophysiology facility at ICAR-IIHR to identify the potent chemical cues and also locate the trophic level at which these chemical cues are potentially active. This will help to formulate end-to-end programs with viable behavioural cues that can be served as powerful IPM components. Thus, customized work plan to take the advantage of collaborative work on chemical ecology and analytical chemistry is the need of the hour in order to elucidate, develop and standardize the field application of green chemistry via semiochemical based IPM programs.



M.R. Dinesh  
Director

### From Page-1

monitoring and suppressing fruit fly populations. This process has been licensed to 10 (9 private and 1 KVK) entrepreneurs. This invention is cost effective, long lasting, farmer friendly and eco-friendly technique of monitoring fruit flies occurring in fruit (mango, guava, annona, citrus, etc) orchards for making IPM decisions (Fig.1). The cost of the fruit fly trap is very affordable even for a poor farmer. Thus, by installing 6 to 8 traps per acre (as per recommendation of IIHR) the fruit flies can be effectively monitored and based on trap catches, sanitation as well as bait sprays are integrated to manage fruit flies on long term basis. Several institutions viz., NABARD, NHM, RKVY, DBT have financed to conduct FLD's (Front Line Demonstrations) in mango growing states of our country mainly in Karnataka, Andhra Pradesh, Kerala, Odisha, Uttar Pradesh and Jharkand. The impacts have been phenomenal and many states

adopted the technology and ICAR-IIHR is assisting in transfer of technology thereby avoiding precious loss of fruits at harvest accounting for Rs. 8000 crores every year. This technology earned prestigious DBT Biotech Product & Process Development and Commercialization Award-2014.



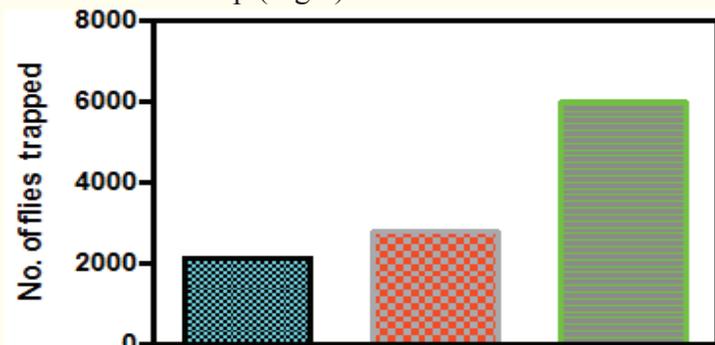
Fig. 1. ICAR-IIHR methyl eugenol trap for male fruit flies

The success saga of ME trap further opened up the possibilities of identification of female fruit fly attractant for *B. dorsalis* (Arka Dorsolure F) under an ICAR National Fellow Project. *B. dorsalis* being highly polygamous, even after 90% removal of males from natural population, the remaining 10% are sufficient to fertilize the females. However, there are protein baits which have been explored widely with varied results. Arka-Dorsolure F is a novel invention that provides a kairomonal blend for attracting particularly gravid female *B. dorsalis*. The pilot scale field studies revealed the potential of this blend in successfully attracting *B. dorsalis* females (Fig.2).



**Fig. 2. Field Trial of Arka Dorsolure F that attracts gravid female *B. dorsalis***

Further efforts under the Project led to identification of multicomponent lure, Arka Bactro+ that could significantly attract more male flies of *B. dorsalis* and *B. correcta* over traditional ME trap (Fig.3).



**Fig. 3. Enhanced catches of fruit fly species (*B. dorsalis* + *B. correcta*) in different traps**

Arka SalicyProtect, a pre-harvest spray intervention to protect mango fruits from fruit fly attack by altering the volatile profile of fruits using natural phyto-hormone spray was standardized as an eco-friendly technology. This technology could reduce fruit fly infestation >50% over untreated control. Exogenous application of plant elicitors like salicylic acid, jasmonic acid were found to

impact insect-plant interactions through modified host plant volatile emissions.

The role of semiochemicals was less explored for the notorious fruit piercing moths, *Eudouima* spp that are serious pests on commercially important fruit crops including pomegranate, citrus, guava, papaya, carambola, grapes etc. Moths feed at night by penetrating the rind of ripe fruits with their strong proboscis and suck the juice. Internal injury consists of a bruised dry area beneath the skin and secondary rots develop at puncture site. Attempts were made at ICAR-IIHR to explore the possibility of attracting moths to kairomonal blends and bait fruit technology using guava and banana fruits was standardized. This technology could divert moths from main crop (pomegranate) substantially, thereby serving as a economically viable control measure. Further, intensified attempts revealed the potential of fruit kairomones in attracting the moths to artificial lure dispensers (Fig. 4). Attempts are underway to standardize the semiochemical dose and dispensers for field application.

At present the prospects of using semiochemical technologies for controlling various insect pests of vegetable crops are mainly limited to sex pheromones of lepidopterans and melon fruit flies. Among the lepidopterans, Helilure [(Z) 11 hexadecanal + (Z) hexadecanal (97:3)] for *Helicoverpa armigera*, Spodolure [(Z,E) 9,11 tetradecanyl acetate + (Z,E) 9, 12 dienyl acetate (19:1)] for *Spodoptera litura*, Leucilure [(E) 11 hexadecenyl acetate + (E) 11 hexadecen-1-ol (100:1)] for brinjal fruit and shoot borer, Leucinodes orbonalis, Nomate-DBM or Checkmate-DBM [(Z) hexadecanal 11-enal + (Z) exzadec-11-enyl-acetate] for diamondback moth, *Plutella xylostella* and for melon fruit flies, *Zeugodacus cucurbitae*, 4-(4=hydroxyphenyl)-2-butane acetate, popular as cue lure are commercially available and fit well into the current IPM programs. The possibility of exploring and integrating potent viable semiochemical approaches of either insect or host plant derived chemical cues for several priority target pests across vegetable crops viz., Solanaceae, Cruciferaceae, Cucurbitaceae etc will pave the way for the new interventions to make current IPM programs more robust. Strenuous efforts to explore the semiochemical possibilities for sucking pests like aphids, whiteflies, thrips, hoppers with a clear scientific understanding of chemical ecology interactions between host plant-insect pest-natural enemy will help in designing robust, reliable



**Fig. 4.** Attraction of fruit sucking moths, *Eudocima materna* to kairomone embedded dispensers

and sustainable IPM components.

It is now within our reach to facilitate the discovery of relevant chemical cues with available sensitive biochemical and behavioural equipments. Nevertheless, detection and identification of potential semiochemicals for several Indian horticultural crop pests are still rudimentary and particularly needed. Our thorough understanding of insect-insect and insect-plant interactions via semiochemicals that are involved in tri-trophic interactions could form an integral component for updating the current IPM programs. Future applications of semiochemicals solely depend upon the availability of potential cues that enable the efficient manipulation of mate-and host- finding behavior of horticultural crop pests.

### Research Highlights

#### Yield and quality parameters of Dragon fruit lines

Among the 14 lines characterized for yield and quality, the weight of dragon fruit ranged from 188 g to 630 g. The line I/2 registered maximum fruit weight (630 g), length (11.5 cm) and breadth (8.60 cm). The rind weight ranged between 87-149 g per fruit. Number of seeds in each fruit varied largely from 754 to 7289 and the seed weight ranged from 1.36 to 8.03 g. The pulp colour was white and pink, while the rind colour was yellow and pink. Total Soluble Salts ranged from 9 to 15.20B.



*Dragon fruit lines*

#### Soilless Production Technology on Arka Fermented Cocopeat for Colour Cabbage

The production technology for soilless cultivation is standardized for red cabbage/colour cabbage on Arka Fermented Cocopeat in the open field as well as protected condition. Nutrient dose of 185 ppm N-NO<sub>3</sub>, 41 ppm P and 210 ppm K per plant recorded maximum stem diameter (25.7 mm), number of leaves (24.8), head diameter (36.8 cm), head length (14.6 cm), average head weight (972 g/plant) and yield (54 t/ha). Maximum stem diameter (22.5 cm) and number of leaves (28.1) are recorded with open-field conditions. Red cabbage raised on soil registered maximum stem diameter (24.9mm), number of leaves (28.3), head diameter (36.8cm), head length (13.7cm), average head weight (977.8 g) and yield (54.3 t/ha) compared to Arka Fermented Cocopeat (817.8 g head weight and 45.4 t of yield /ha). Comparison of soilless cultivation of red cabbage in open-field and polyhouse indicated that maximum plant height (25.7 cm), head diameter (33.7 cm), head length (12.9 cm), average head weight (817.8 g/plant) and yield (45.4 t/ha) are noticed in polyhouse condition.



*Soilless culture of colour cabbage on AFC under protected conditions*

#### Novel jackfruit selections with attractive coppery red flakes for homesteads

The Central Horticultural Experiment Station (CHES) of ICAR-IIHR at Hirehalli, Karnataka, identified elite Jackfruit types in the traditional tracts of Tumakuru and adjoining districts of Southern Karnataka in 2014. Seedlings are dominant in these regions and considerable variability existed for tree morphology and fruit parameters. The survey resulted in shortlisting of 128 samples and about 42 samples were evaluated for basic horticultural traits including colour of flakes and organoleptic evaluation. The description of superior selections are described below: These accessions with deep coppery red or yellowish orange colour flakes have maximum total carotenoids

(1.64-5.83 mg/100 g) and lycopene content (0.17-2.26 mg/100 g) compared to the accession with white colour flakes. Total antioxidant activity ranged from 8.95 to 11 and 9.42 to 14.93 mg AEAC/100g in FRAP and DPPH assay, respectively.



white colour flakes with CHESHJF-1 coppery red



CHESHJF-2 coppery red

CHESHJF-3 Yellowish orange

### Characterisation of Jack Fruit varieties

The average fruit weight was 6.56 kg in yellow type and 6.25 kg in pink type jackfruits. The flake percentage was 28.44 in yellow types and 34.83 in pink types. The seeds and rind constituted 10.5 and 47.4% of the total fruit weight in yellow types and 10.3 and 50.7% in pink types, respectively. The flakes of yellow types had 19.48°Brix TSS, 0.493% titratable acidity, 8.51 mg/100g vitamin C, 2.228mg/100g total carotenoids, 15.91% total sugars and 299.14mg AAE/100g total antioxidants. The pink type flakes registered 22.3°Brix TSS, 0.80% titratable

acidity, 6.50mg/100g vitamin C, 15.85% total sugars, 4.28mg/100g total carotenoids, and 167.07 mg AAE/100g antioxidants.

### Tomato

Four F1 hybrids (H-385, H-387, H-404 & H-423) were found promising for yield, quality and resistance to ToLCBV. Two inter-specific plants between *Solanum lycopersicum* (15 SB SB) and *S. peruvianum* (IIHR-2809) successfully established in the field and back cross to recurrent parent was taken up to introgress ToLCNDV resistant genes in to cultivated background.

### Chilli

Identified the sources of resistance to whitefly transmitted Chilli Leaf Curl Begomovirus (ChiLCV) in chilli (*Capsicum annum* L.)

### New Releases

#### Varieties identified at National Level



Dolichos variety IIHR-162-2

S.No.	Traits	CHESHJF-1	CHESHJF-2	CHESHJF-3
1.	Fruiting season	March-July	March-July	March-December
2.	Number of fruits/ tree	450 (35 yrs.)	200 (25 yrs.)	250 (50 yrs.)
3.	Fruit weight (Kg)	2.44	2.05	7.35
4.	Flake/Fruit ratio	30.21	36.81	61.22
5.	Estimated yield per tree (Kg)	1098	410	1836
6.	Number of flakes per fruit	30.0	44.4	150.0
7.	Weight of each flake (g)	24.6	17.0	30.0
8.	Flake thickness (mm)	8.5	7.2	7.1
9.	Flake Colour	Coppery Red	Coppery Red	Yellowish orange
10.	TSS (°Brix)	31.0	31.0	28.5

Dolichos bean variety IIHR-162-2 was recommended for release in Zone 7 and 8 during the XXXV Group meeting of AICRP on Vegetable Crops, 2017.

### Varieties identified at Institute Level

**Arka Nikita:** High yielding GMS based Okra F1 hybrid (GMS-4 x IIIHR-299-14-11-585) is identified for release by the Institute in 2017. Early flowering and first female flower appears at 9th node from the base of the vine. It takes 39 days for the first flower appearance and 43 days for first picking of fruits. It produces dark green, medium, smooth and tender fruits with excellent cooking quality, rich antioxidant activity, high mucilage content (1.08 % (FW) and high edible fiber content (8.85 % on DW basis). It is rich in minerals like potassium (3.7 %), calcium (997 mg/100 g), magnesium and iodine (33.31 $\mu$  g/kg). The yield level is about 21-24 t/ha in 125-130 days duration.



*Arka Nikita-GMS based F1 hybrid*

### Arka Yojith-white onion variety developed for dehydration

Onion based products have wide applications in food processing as well as many other industries. The demand for the processed products is increasing day by day due to its convenience to handle and use particularly dehydrated onion. In dehydration, fresh material is dried to residual moisture by physical removal of water by hot air drying. This reduces the bulk and due to the light weight restraints from heavy freight charges which is economical on commercial scale. The dried material can rehydrate by using water. There is a scope for exporting dehydrated onions as many processing units under export-oriented unit schemes have been installed in India. Onion processors source raw materials for dehydration



*Field view of Arka Yojith Bulbs of Arka Yojith*



*Flakes and Powder from white onion variety*

from open markets which lack uniformity, quality and are low in dry matter content and total soluble solids. White onions are preferred over red and other colour onion as the product quality and storage quality is superior to other colour onion. Recently identified white onion variety ArkaYojith (AS16) holds promise in this regard.

### Identification of self-compatible line in tuberose

The tuberose accession IIHR-6 showed fruit set/seed set upon autogamy and geitonogamy and found to be self compatible. It has longest spike of 121-129 cm with the single flower weight of 1.00 to 1.32 g and 45-50 number of flowers per spike.



*Self pollination and fruit set in IIHR-6 tuberose*

### News and Events

#### Technical Review Meeting of KVK Hirehalli

On 17th April, 2017, a review meet of KVK, Hirehalli was organized at ICAR-IIHR, Bengaluru. Dr. M R Dinesh, Director, ICAR-IIHR, Dr. Sreenath Dixit, Director, ATARI and Dr. C K Narayanan, Chairman PME Cell were present in the meet. Dr. N Loganandhan, Head, KVK and all the staff of KVK took part in the event. The progress of KVK in last one year was reviewed by the Director, ICAR-IIHR. He suggested for concentrated efforts of KVK in consultation with concerned Heads of Divisions at IIHR. The Director, ATARI suggested for better functioning of KVK. Dr.C K Narayana asked the staff to document the progress in comparison with the benchmark data collected in earlier phase. The points shared were noted down as proceeding and the same will be followed for further improvement of KVK.



*Technical Review Meeting*

#### Visit of Parliamentary committee on Agriculture

Parliamentary committee on Agriculture under the chairmanship of Shri.Hukum Narayan Yadav along with 16 MP's visited ICAR-IIHR, CHES, Chettalli on 27.04.2017.



*Visit of Parliamentary committee Humid Tropics*



*Visit of Parliamentary committee*

#### Exploration and collection of tamarind from Chhattisgarh

An exploration and collection of tamarind in the common village land and forest fringe areas of Bastar and Narayanpur areas of Chhattisgarh state was undertaken in the month of April. Collections were made from eleven different locations and the passport data was recorded. Tamarind pods and leaves were collected for further analysis. Information regarding harvesting, post-harvest practices, marketing and superior trees in the area was obtained by interaction with local people.

#### National Conference on Horticultural Crops of Humid Tropics - Diversification for Sustainability

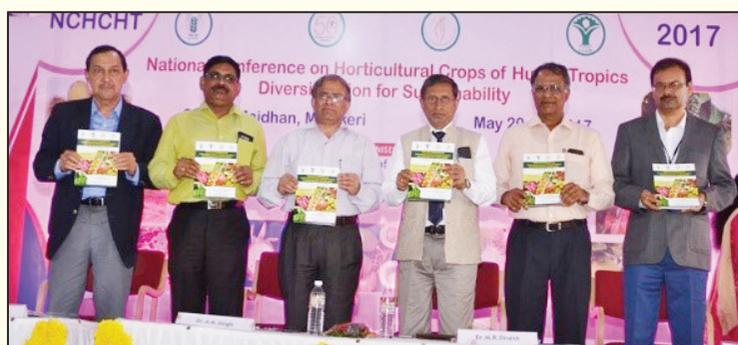
National Conference on Horticultural Crops of Humid Tropics Diversification for Sustainability was organized by CHES, ICAR-IIHR, Chettalli at Gandhi Maidhan, Madikeri, Coorg on May 20-21, 2017 in collaboration with Society for Promotion of Horticulture (SPH), Bangalore. The conference was aimed to create a platform for exchange of ideas and thoughts among the scientific fraternity, entrepreneurs, farmers, growers, students etc. from ICAR institutes, SAUs, KVKs and other Govt. and Non - Govt. organizations from different parts of the country who have been associated with humid tropical horticultural crops. The Inaugural session was chaired by Dr. M R Dinesh, Director, IIHR, Bangalore, Guest of Honour, Sri. Bose Mandanna, Progressive Planter & Ex-Chairman, Coffee board. Chief guest of the programme was Dr. A K Singh, DDG (Horticultural Science), ICAR, New Delhi, Dr. Janakiram, ADG (Horticultural Science) ICAR, New Delhi, Dr. V A Parthasarathy, Ex-Director IISR, Calicut and Dr. Doreyappa Gowda, Head, CHES, ICAR-IIHR, Chettalli, Coorg.

On this occasion, a souvenir and abstracts of National conference, CD-ROM of lead papers and abstracts, Indian Horticulture – a Special issue of IIHR and a technical bulletin on Management of diseases and pests of coorg mandarin were also released. Honorable DDG (Hort.) Dr. A K Singh emphasized on conservation and utilization of these less known fruits for food and nutritional security of the common people. Dr. M R Dinesh, Director, IIHR, Bengaluru described the achievements of the station and about research and development of the underutilized fruits particularly Rambutan, Mangosteen, Avocado, Passion fruit etc. He emphasized for more work on production and Post harvest technologies of these crops. Dr. V A Parathasarthy, emphasized the role of underutilized fruits and tree spices in the livelihood security of rural and tribal people. He opined on farm conservation of the indigenous underutilized fruits and tree spices. Dr. Janakiram, ADG (Horticultural Science), ICAR, New Delhi spoke about scope of various underutilized horticultural crops in future markets. More than 1000 scientists, farmers/planters, progressive growers, processors, entrepreneurs, government officials and marketing experts from all over the country viz. Karnataka, Tamil Nadu, Maharashtra, Andhra Pradesh, Kerala and Goa participated during the two days conference.

Secretary, Department of Agriculture, Horticulture and Sericulture, Government of Karnataka and Dr D L Maheshwar, Vice-Chancellor (VC), University of Horticultural Sciences (UHS), Bagalkot visited the mango diversity exhibition on 27.5.2016. Both the dignitaries had congratulated the Scientists for displaying an excellent variability collected from various parts of the country and abroad. This exhibition has attracted 1100 visitors from all walks of life and visitors have shown interest in knowing the variety name, place of its origin and its importance. Mango fruits of selected varieties were sold to the visitors and some of them have shown interest on procuring the grafted plants of traditional varieties of mango.



*Mango diversity exhibition*



*National Conference on Horticultural Crops*

### **Mango diversity exhibition**

Mango diversity exhibition has been organized for three days at ICAR-IIHR, Hesaraghatta, Bengaluru during 26-28 May, 2017. A total of 329 varieties which includes the hybrids, indigenous varieties, polyembryonic, coloured /exotic varieties, pickling (appemidi) and farmers varieties have been displayed. This exhibition was inaugurated by Dr. Tejaswini Anantkumar, Managing Trustee, Adama Chethana Foundation, Bangalore. Shri. Maheshwar Rao, IAS,

### **World Environment Day**

ICAR-Krishi Vigyan Kendra (IIHR, Hirehalli), Tumakuru celebrated the World Environment Day on 5th June 2017 at KVK campus with the theme 'Connecting to nature'. The programme was organized in collaboration with Bhavalaya Trust and WeRoar (Wild Animal Emancipation Reptile Oriented Awareness and Rescue), Tumakuru, with the following experts like Sri Nagendra, Nature conservator, Ornithologist Sri Swaroop, Bat Conservationist Sri Rajesh, Apiculture specialist Sri Apoorva, Desi Food and Nutrition specialist Sri Umamanjulal from Tumakuru.

The programme started with the prayer by Ms Shruthi, followed by inaugural address by Dr.N Loganandhan on the objective of the programme. All the participants were given with certificate of appreciation on World Environment Day. All the experts shared their experience in conservation of nature. Sri Ramesh, SMS (Soil Sci) shared his experience in water management to address the

climate change and Sri Prasanth briefed about the instructional farm and tree species planting during the day. After tree planting, millets based food was tasted by the participants. All the staff members of KVK participated in the programme and planted saplings in the premises. About 300 School and College Students and farmers actively participated in this World Environment day. This programme was coordinated by Dr.N. Loganandhan, Senior Scientist and Head, Sri K N Jagadish ACTO/SMS Agril. Extension, ICAR KVK Hirehalli, Tumakuru.



*World Environment Day*

### **Demonstration on composting of coffee husk**

Demonstration on 'Composting of Coffee husk' was organized for coffee planters on 13.06.2017. The demonstration was conducted in the field of Mr. Rohit Mathew at Boikeri, Madikeri, Kodagu. Dr. Selvakumar G, Principal Scientist, ICAR- IIHR explained about the various aspects of compost making and the benefits of using microbial consortium in composting coffee husk. Farmers shared their views and cleared their queries about enriched compost making. Demonstration on composting of coffee husk using Arka Microbial Consortium - Decomposer was done in the field. Handouts about coffee husk composting and Importance of Arka Microbial Consortium in various crops in both Kannada and English was distributed among the farmers. Dr. V. Sankar, Principal Scientist, CHES, Chettalli, Dr. Saju George and Dr. Veerendrakumar, from KVK, Gonikkoppal also attended the program.



*Demonstration on composting of coffee husk*

Field visit was conducted after the demonstration and leaf samples were collected from coffee and pepper crop for nutrient analysis for the farmers. About 25 farmers/planters from Coorg were actively participated and benefitted in this demonstration. The program was coordinated by Vaisakhi K C, Scientist of CHES, Chettalli.

### **Interface meeting on Avocado Grading and Marketing**

An interface meeting on "Avocado Grading and Marketing possibilities in Kodagu district" was conducted in association with Puthari Farmers Producer Company Ltd (PFPCCL) at KVK Gonikoppal on 21st June, 2017. The meeting was attended by the representatives from a company called Farm Folks who is into supply chain management of fruits and vegetables in and around Mysore. Proper harvesting of Avocados using harvesters with some stalk retained and grading was discussed with farmers. It was decided that the Farm Folks Company will collect the avocados pooled by PFPCCL once in a week. The Puthari Farmers producer Co. Ltd will be looking into the logistics of collection and grading and see the feasibility of creating a sustainable supply chain model for supply of Avocados. The programme was attended by about 40 farmers, KVK officials and Company (Farm Fork) representatives.

### **International Yoga Day**

ICAR-Krishi Vigyan Kendra and Central Horticultural Experimental Station jointly celebrated International Yoga Day on 21.6.2017 at Hirehalli Campus. The programme started with Yoga Prayer. Welcome and Introduction about Yoga by K.N.Jagadish, Nodal Officer ACTO/SMS Agril.Extension. Smt. Vasudha

Prasad, Yoga Guru briefed about Importance of yoga, and also demonstration and mass performance by Smt. Vasudha Prasad and Master Prathik and Team, Tumakuru. Sri Nagendra briefed about Yoga and Health. About 150 Boys and Girls Students from Sri Siddaganga School, Hirehalli in presence of Sri R. Nanjappa Head Master and Staff members of school actively participated in Yoga day. Prasanth J M, Hanumanthegowda B, Radha Banakar, Dr. Somashekar,



*International Yoga Day*

ACTO/Subject Matter Specialists, Shashidhar K N, Programme Assistant and other Permanent and Temporary staff members of KVK and CHES actively participated in the programme. Dr. G Karunakaran, Head In-charge, ICAR-CHES, Hirehalli participated in the programme and felicitated Yoga Guru by giving Amla Juice and Candy. This programme was coordinated by Sri K.N. Jagadish Nodal Officer and Sri Prasanth JM ACTO/SMS Horticulture ICAR KVK Hirehalli, Tumakuru.

### **Jack fruit diversity fair**

The two day Jackfruit diversity fair was organized by ICAR-IIHR from 24-25 June, 2017. In the programme, more than 120 Jackfruit diversities representing the accessions maintained at NAGS of ICAR-IIHR and farmer's collections were exhibited. The fair was inaugurated by Dr. Keerti Singh, Ex- Chairman, ASRB, New Delhi. Other dignitaries included Dr. A K Singh, DDG (HS), ICAR, Dr. Janakiram, ADG (HS), ICAR, Dr. Narayana Gowda, Ex-Vice Chancellor, UAS, GKVK, Bangalore, Dr. G L Kaul, Former DDG (HS). The event included exhibition of fruits and farmer's – scientists interface meeting on the first day. The highlight of the fair was creating awareness among the farmers about the importance of the crop on the health benefits and its revenue generation potential in the fruit crop based cropping system. The farmer's –



*Jack fruit diversity fair*

scientists interface meeting was coordinated by Dr. H Ravishankar, In charge Head, Division of Fruit crops in which outside experts, Dr. Narayana Gowda, Ex-Vice Chancellor, UAS, GKVK, Bangalore; Shri. Sree Padre, Editor, 'Adike Patrike' and crusader of Jackfruit promotion among the farming community besides scientists of ICAR-IIHR and GKVK, UAS also participated and responded to the grower's queries.

The main issues that were prominently articulated during the interaction included: availability of genuine, vegetative propagated and quality planting materials of elite types especially orange flaked ones; possibility of year-round production; processing and value addition; marketing; utilization of Jackfruit seed; vegetable types etc., About 150 farmers participated in the interaction. On 25 June, 2017, the fair was open to the public.

### **XXXV Group meeting of AICRP on Vegetable Crops**

XXXV Group Meeting of Vegetable research workers of 'All India Coordinated Research Project on Vegetable Crops' was held from 24 -27th June, 2017 at ICAR-IIHR, Bengaluru. Important delegates included Dr Kirti Singh, Dr. G Kalloo, Dr. A K Singh, Dr. T Janakiram, Dr. B Singh, Dr. A B Rai and Dr. M R Dinesh. More than 250 delegates including all the scientists of the Division of Vegetable crops participated in the Group meeting. Dr. Manmohan Attavar, Chairman, Indo-American Hybrid Seeds Pvt. Ltd, Bengaluru was felicitated for his significant contributions for the development of vegetable seed industry in the country. Exhibition stalls by ICAR-IIHR and private seed companies were also put up to display their technologies.



Group meeting of AICRP

### Review of TSP activities and Input distribution programme

Under Tribal sub plan project, CHES, ICAR-IIHR, Chettalli, review meeting of project and horticultural inputs distribution programme was organized under the chairmanship of Honorable DDG (Hort), Dr.A K Singh, ICAR, New Delhi along with our Director Dr. M R Dinesh, IIHR, Bangalore for the beneficiaries of identified tribal group from four villages (Hosapodu colony, Muthugadagadde, Yakanagadde and Bungle podu) at BiligiriRangana Betta (BR Hills ) which comes under the Yalandur taluk of Chamarajanagara district on 26-06-2017. Dr. I N Doreyappa Gowda, Principal Scientist and Head (i/c) Chettalli gave a brief about the juice making technology of jamun, guava, amla which are available in plenty at these hills for commercial exploitation. The Director, IIHR explained technologies available at IIHR for adoption, seed village concept for multiplication of commercial flower crops and assistance for marketing of their produce. Dr. A K Singh, DDG (Hort.) addressed the gathering and suggested tribal beneficiaries for proper utilization of TSP for sustainable livelihood

and maintenance of the ecosystem. Dr.H P Sumangala, Scientist explained about nursery set up of indigenous ornamental plants at BR Hills for upliftment of soliga



Review of TSP activities

tribes. During this program, soil health cards, pick axe, sickles, crow bars, bamboo baskets and improved variety of crossandra seedlings were distributed to all tribal beneficiaries. The programme was concluded with tribal dance performed by tribal youth and vote of thanks by MrsSwathy, Technical officer, CHES, Chettalli. This programme was attended by president of Taluk SoligaAbhinidhi Society of Yalandur, Soligas tribe's leaders and more than 170 tribal beneficiaries of BR Hills and school children's of Vivekananda GirijanaKalyana Kendra (VGKK), BR Hills.

### Seminar on Black pepper

A Seminar on 'Recent advances in production and protection technologies of Black pepper' was organized by KVK, Gonikoppal in association with Nalnad Farmers Recreation & Association on 28th June, 2017 at Napoklu, Kodagu district. KVK Scientists talked about the integrated nutrient and pest management in Pepper. Mr. M C Nanaiah, DDM, NABARD spoke about the importance of Farmers producer organizations. About fifty farmers participated in the programme.

## Transfer of Technology

### On campus training

Title	Date	No. of Participants
<b>ICAR-IIHR, Bengaluru</b>		
1. Training programme on beekeeping	Apr 18	06
2. Hand pollination technique in custard apple hybrid Arka Sahan	May 03	55
3. National Workshop on "Doubling the Income of Mango Growers in India"	May 18-19	100
4. Training on mushroom spawn production and mushroom cultivation	May 18-26	31

5. Improved Crop Management Practices in Papaya & Banana	Jun 6-7	49
6. Improved Crop Management Practices in Grapes & Pomegranate	Jun 8-9	34
7. Advanced Technologies for Horticultural Crops	Jun 12-17	21
8. Integrated Crop Management for Higher Productivity & Quality of Hot Chilli	Jun20-22	30
9. Training program for rural women	Jun27-28	40
<b>ICAR-KVK, Hirehalli</b>		
10. Training program on Eco-Friendly – Areca Leaf Plate Making	Jun3	40

### Off campus training

Title	Place	Date	No. of participants
<b>ICAR- KVK, Gonikoppal</b>			
Scientific Black pepper cultivation practices	Bettadalli, Virapet, Kodagu	Apr 18	53

### Field Demonstrations

#### On Farm Trials

Name and Number of Trial	Location
<b>ICAR-IIHR, Bengaluru</b>	
<b>Demonstration of IIHR Nursery Machinery</b>	College of Agriculture, Vellayani, KAU, Trivandrum, Kerala.
1. Growing media handling, sieving and nursery bag/protray/grow bag filling machine	
2. Growing media mixing and nursery bag/protray/grow bag filling machine 3. Protray dibbler cum vacuum seeder	
Demonstration of Four chilli F1 hybrids viz., ArkaMeghana, ArkaHarita, Arka Khyati and ArkaSweta (1)	ICAR – IIHR, Bengaluru
Water melon F1 hybrid Arka Akash(1)	Eandhur village, Villupuram Dt., Tamil Nadu
Field demonstration of ICAR-IIHR bred vegetable varieties / hybrids & Improved cultivation practices (1)	ICAR – IIHR, Bengaluru
<b>ICAR-KVK, Hirehalli</b>	
Assessment of Red gram varieties for Disease Tolerance & Higher Yield(3)	K T Halli, Pavagada Taluk

### Front Line Demonstrations

Topic	Nos.
<b>ICAR-KVK, Hirehalli</b>	
1. Conservation Furrow (CF) as an <i>in-situ</i> Moisture conservation to combat mid-season drought in Maize	10
2. Improved Production practices & Post Harvest Management in Mango	2 Groups
3. Demonstration of ArkaActino-Plus (ACP) on Growth & Yield of Brinjal	10

4. Demonstration of Bio-rationals in French bean	5
5. ICM in Tomato	5
6. ICM in Coconut	10
7. Management of Wild Boar in Farming system	5

### Exhibitions:

Event	Venue and Date
<b>ICAR-IIHR, Bengaluru</b>	
1. Kisan Mela	Motihari, Bihar, April 15 - 19
2. Mango and Jack Exhibition-Cum-Mela	Labagh, Bengaluru, May 05
3. National Conference on Horticultural Crops of Humid Tropics Diversification for Sustainability	Madikeri, May 20-21
4. Exhibition cum Sale -Mango	UHS, Bagalkot, May 29
<b>ICAR-KVK, Hirehalli</b>	
5. National conference on Millets April, 29-30, 2017	Palace Ground, Bengaluru, April 29-30
<b>KVK, Gonikoppal</b>	
6. Awareness programme on Protection of plant Varieties and Farmers Right Act	UAHS, Shimoga, May 03
7. National Conference on Horticultural Crops of Humid Tropics Diversification for Sustainability	Madikeri, May 20-21

### Field visit

Dr.Saju George, Mr. Veerendra Kumar, K.V. and Dr.Sevakumar visited AMC technology adopted plots of Mr.P.R. Subash,Arvathoklu and Compost Demonstration site (Using IIHR decomposer culture) of Mr. Rohith Mathews at Suntikoppa, Kodagu.

Mr. Prabhakar, B. visited Mapaethodu village of Virajpet taluk for machine aided tray system of paddy nursery preparation managed by Shri Kakamada Arjun and organized by NaadaMannuNaadaKoolu organization on 29<sup>th</sup> June 2017.

Dr.Saju George and Mr. Prabhakar, B. visited organic certified coffee and Black pepper plantation of Shri. Ittira Lalappa at Hudikeri village of Virajpet taluk on 29<sup>th</sup> June 2017

Dr. G. Karunakaran, Sr. Scientist, CHES, Hirehalli has taken up survey to identify the elite clones of Jackfruit at Tumakuru and adjoining districts (*viz.*, Hassan, Bengaluru Rural, Chikkaballapura, Ramnagara and Chitradurga during April-June

### Exposure visit

#### Exposure visit for Members of Puthari Farmers Producer Company Limited

Members of Puthari Farmers Producer Company Limited were taken to FPO (Coconut Board), Hunsur, Mandya Organics Cooperative Society, Maddur and Jack Diversity Mela held at IIHR, Bengaluru on 24<sup>th</sup> June 2017. The tour was sponsored by NABARD and facilitated by KVK, Gonikoppal.

#### A study tour cum Exposure visit to Andhra Pradesh KVKs

A study tour cum exposure visit was organised for KVK staff of Karnataka by ATMA, Bengaluru during June 17-24, 2017. Dr.N.Loganandhan, Head and Mr.PR.Ramesh, SMS (Soil Sci.), KVK Hirehalli took part in the event. The visit covered important Agricultural institutions, KVK's and fields of progressive farmers in Andhra Pradesh. Visit to KVK, Visakapattinam and KVK, Rajamundry under Central Tobacco Research Stations

were noteworthy. Exposure visit to Visakha dairy unit at Vijayawada and Kadium nursery at Rajamundry were much informative.



### Field Day:

### Field Day On Yard Long Bean Variety Arka Mangala And Awareness Programme On Vegetable Cultivation

One day awareness programme on vegetable cultivation and Field day on Yard long bean variety Arka Mangala was organized by KrishiVigyan Kendra,

Gonikoppal in the field of Shri Thimmaiah, S.C., at Nalloor village of Virajpet taluk on 12<sup>th</sup> May, 2017. About fifty farmers participated in the event. Dr. T.S. Aghora, Principal Scientist, Division of Vegetable crops, IIHR, Bengaluru spoke about the prospects of summer vegetable cultivation after the main crop paddy in the district and particularly cultivation of leguminous vegetable crops (Beans, Yard long bean, Dolichos) for getting good income in a short span of 2 to 3 months. This practice can also aid in enhancing the soil fertility. Dr. E. Srinvas Rao, Principal Scientist, Division of Vegetable crops, IIHR, Bengaluru talked about the new varieties in cucurbitaceous vegetable crops and eco-friendly management of vegetable crops. Officials from Extension Education Unit, College of Forestry (UAHS, Shivamogga), Department of Horticulture, Agriculture and ATMA also participated in the event.

### Sale of ICAR-IIHR products through ATIC

The ATIC realized revenue of **RS. 5, 87,985** through the sale of Mushrooms and **Rs. 9, 32,081** through the sale of products and publications during the quarter.

### Commercialisation of Technology:

Name of the Company	Technology
M/s KrishiBioproducts& Research Pvt Ltd, Indore	Mass production of Trichoderma harzianum
M/s Gujarat Beej Nigam, Gujarat	Mass production of Trichoderma harzianum
M/s Gujarat Beej Nigam, Gujarat	Mass production of Pseudomonas fluorescens
M/s Gujarat Beej Nigam, Gujarat	Mass production of Verticilliumchlamydosporia
M/s NafedBiofertilizer, Indore	Mass production of Trichoderma viride
M/s Liebigs Agro Chem Pvt Ltd, Kolkata	Mass production of Pseudomonas fluorescens
M/s Liebigs Agro Chem Pvt Ltd, Kolkata	Mass production of Trichoderma viride
ESAF Swasraya Producers Company Ltd,Kerala	Arka Microbial Consortium (Liquid)
ChamundeshwariMahila sangha, Chitradurga	Onion Paste Making
Viswa Mithra Bio Agro (P) Ltd, Guntur	Mass production of Trichoderma harzianum
M/s International Panaacea Ltd, New Delhi	Mass production of Trichoderma harzianum
M/s Best Crop Science, New Delhi	Mass production of Trichoderma viride
M/s Best Crop Science, New Delhi	Mass production of Trichoderma harzianum
M/s Best Crop Science, New Delhi	Mass production of Verticilliumchlamydosporia
M/s FishfaBiogenics, Metoda, Rajkot	Mass production of Trichoderma viride
M/s FishfaBiogenics, Metoda, Rajkot	Mass production of Trichoderma harzianum
M/s FishfaBiogenics, Metoda, Rajkot	Mass production of Pseudomonas fluorescens
M/s FishfaBiogenics, Metoda, Rajkot	Mass production of Verticilliumchlamydosporia
Vegetable and Fruit Promotion Council Keralam,Kerala	Vegetable and Banana Micronutrient Formulation

The Passionfruit Company	Passion Fruit Beverage
M/s RR seeds Agri Tech Pvt Ltd	Advanced Breeding lines of Okra IIHR-385-5-1 Advanced Breeding lines of Okra IIHR-386-7-2 Pre released F1 Hybrid OKMHS-3(GMS-4 X IIHR-299-1) and their parental lines
M/s KrishiVikasSahakariSamilti Ltd, Jaipur	Mass production of Pseudomonas fluorescens
M/s KrishiVikasSahakariSamilti Ltd, Jaipur	Mass production of Verticilliumchlamydosporia
M/s Synergy Crop Science Pvt Ltd, Jaipur	Mass production of Trichoderma viride
M/s Synergy Crop Science Pvt Ltd, Jaipur	Mass production of Trichoderma harzianum
M/s Synergy Crop Science Pvt Ltd, Jaipur	Mass production of Pseudomonas fluorescens
M/s Synergy Crop Science Pvt Ltd, Jaipur	Mass production of Verticilliumchlamydosporia
M/s Pradhan Fertilizers Manufacturing Co, Gujarat	Vegetable Micronutrient formulation
Ms NamrathaGoenka, Bengaluru	Technology for osmotic dehydration of amla, jackfruit and papaya
IIHR Nursery machinery	College of Agriculture, Kerala Agricultural University, Vellayani, Trivandrum, Kerala.
M/s Dinakar Seeds Pvt Ltd., Gujarat	Chilli F1 hybrid Arka Khyati parental lines

### Distinguished visitors

#### ICAR-IIHR

Dr. Tejasvini Ananth kumar  
Chairperson, Adama Chetana foundation  
Bengaluru

❖ Parliamentary Committee on Agriculture under the chairmanship of **Shri. Hukm Narayan Yadav** along with 16 MP'S visited ICAR-IIHR, CHES, Chettalli on 27.04.2017.

#### CHES- Chettalli

❖ **Dr.P G Chengappa** Ex vice-chancellor, UAS, Bangalore visited CHES, Chettalli on 07-06-2017.

#### CHES- Tumkur

❖ **Dr. N Kumar**, Former Dean (Hort.) , HC and RI, Tamil Nadu Agricultural University , Coimbatore-3 on 20th July 2017

### Personalia

#### NEW ENTRANT

Smt. P.V.S. Bharathi, Finance & Accounts Officer has been transferred from CTRI, Rajahmundry to IIHR, Bengaluru and reported on forenoon of 21.04.2017

#### PROMOTION

- Dr.Rajiv Kumar, Senior Scientist (Hort.) has been promoted to next higher grade of Principal Scientist w.e.f. 16.07.2015.
- Dr. Carolin Rathina Kumari, Senior Scientist (FMP) has been promoted to next higher grade of Principal Scientist w.e.f. 23.09.15.

#### TRANSFER

- Shri H.D. Parashuram, Technical Officer has been transferred from KVK, Hirehalli to IIHR, Bengaluru and reported on forenoon of 22.04.2017.

- Shri G.M. Prashanth Kumar, Senior Technical Assistant (F/F) has been transferred from CHES, Chettalli to IIHR, Bengaluru and reported on forenoon of 09.06.2017.
- Dr. P. Ramya, Scientist has been transferred from IIHR, Bengaluru to IISS, Mau and relived from IIHR, Bengaluru on 05.06.2017 (AN).
- Dr. Mahendran, Scientist has been transferred from CHES, Chettalli to SBI, Coimbatore and relived from CHES, Chettalli on 06.06.2017 (AN).
- Dr. Nita Khandekar, Principal Scientist has been transferred from IIHR, Bengaluru to IISR, Indore and relived from IIHR, Bengaluru on 06.06.2017 (AN).
- Dr. S. Rajendran, Scientist has been transferred from IISS, Bhopal to IIHR, Bengaluru and reported on 27.06.2017 (AN).

## Newsletter

- Dr. B.R. Raghu, Scientist has been transferred from VPKAS, Almora to IIHR, Bengaluru and reported on 27.06.2017 (AN).
- Dr. B. Mahesha, Scientist has been transferred from IIHR, Bengaluru to CPCRI, Kasargod and relieved from this Institute on 15.06.2017 (AN).
- Shri B.M. Muralidharan, Scientist has been transferred from CHES, Chettalli to DCR, Puttur and relieved from this Institute on 15.06.2017 (AN).
- Ms. SusmithaCherkuri, Scientist has been transferred from IIHR, Bengaluru to IISS, Mau and relieved from this Institute on 15.06.2017 (AN).
- Shri E. Rangaswamy, Scientist has been transferred from IIHR, Bengaluru to CTRI, Rajahmundry and relieved from this Institute on 15.06.2017 (AN).
- Smt. JyothiAppuNaik, Technical Officer (Computer Lab) has been transferred from KVK, Hirehalli to IIHR, Bengaluru and reported on 13.06.2017.
- Shri N. Jayashankar, Senior Technical Officer (Computer Lab) has been transferred from IIHR, Bengaluru to KVK, Hirehalli and reported on 15.06.2017.
- Shri G.M. Prashanth Kumar, Senior Technical Assistant (F/F) has been transferred from CHES, Chettalli to IIHR, Bengaluru and reported on 09.06.2017.
- Shri A. Rajanna, Technician (F/F) has been transferred from CHES, Chettalli to CHES, Hirehalli and reported on 08.06.2017.
- Shri B. Mallesh, Lower Division Clerk has been transferred from IIHR, Bengaluru to KVK, Gonikoppal and reported on forenoon of 14.06.2017.
- Shri Siddagangappa, Skilled Support Staff has been transferred from IIHR, Bengaluru to CHES, Hirehalli and reported on forenoon of 14.06.2017.
- Smt. K. Rangamma, Skilled Supporting Staff retired from Council's service on superannuation on 30.04.2017 (AN).
- Smt. Channabasamma, Skilled Supporting Staff retired from Council's service on superannuation on 30.04.2017 (AN).
- Smt. Periamma, Skilled Supporting Staff, CHES, Chettalli retired from Council's service on superannuation on 30.04.2017 (AN).
- Smt. P. Ningamma, Skilled Supporting Staff, CHES, Chettalli retired from Council's service on superannuation on 30.04.2017 (AN).
- Dr. Akella Vani, Head, Division of Biotechnology retired from Council's service on superannuation on 31.05.2017 (AN).
- Shri Renukananda, Assistant retired from Council's service on superannuation on 31.05.2017 (AN).
- Smt. Saraswathi, Upper Division Clerk retired from Council's service on superannuation on 31.05.2017 (AN).
- Shri V. Laxmana, Skilled Supporting Staff retired from Council's service on superannuation on 31.05.2017 (AN).
- Dr. S. Shivashankar, Principal Scientist retired from Council's service on superannuation on 30.06.2017 (AN).
- Shri S.M.A Qazi, Senior Technical Officer (Lab.) retired from Council's service on superannuation on 30.06.2017 (AN).
- Smt. P.B. Swathy, Technical Officer (Lab.), CHES, Chettalli retired from Council's service on superannuation on 30.06.2017 (AN).
- Shri Hanumantharayappa, Upper Division Clerk retired from Council's service on superannuation on 30.06.2017 (AN).
- Shri Linganna, Skilled Support Staff retired from Council's service on superannuation on 30.06.2017 (AN).

### **SUPERANNUATION :**

- Dr. H.R. Ranganath, Principal Scientist retired from Council's service on superannuation on 30.04.2017 (AN).
- Shri S.C. Chandrashekara, Asst. Chief Technical Officer (Lab.) retired from Council's service on superannuation on 30.04.2017 (AN).

### **MISCELLANEOUS:**

- Dr. B.N.S. Murthy, Principal Scientist has been relieved from his duty on 27.05.2017 (AN) for joining the post of Horticultural Commissioner, Ministry of Welfare & Farmers, New Delhi.

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