ICAR Research Complex for Eastern Region, Patna
पूर्वी क्षेत्र के लिए भा.कृ.अनु.प. का अनुसंधान परिसर, पटना

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Editorial Committee
Dr. A. Dey
Dr. A. Abdul Haris
Dr. Shivani
Dr. Bikash Das

ICAR Research Complex for Eastern Region
ICAR Parisar, P.O. Bihar Veterinary College, Patna 800014, Bihar
Tel: 0612-2223962/ 2228882; Fax: 0612-2223956
Email: drbpbhatt.icar@yahoo.com
Web: www.icarrcer.res.in

From the Director's Desk

System mode research, integrating crop-livestock-fish-agroforestry-horticulture is the priority of the Institute. So far, six integrated farming system models for waterlogged, Hill and Plateau, and irrigated uplands have been developed and found ecologically and economically viable. Development of climate resilient farming system models is yet another priority of the institute since simulation studies have indicated significant decline in yield of rice and wheat in future scenario. Technologies have also been developed for multiple use of water and conjunctive use of water for higher water productivity. The institute has initiated work on Conservation Agriculture, which has demonstrated the profitability of farming besides savings in critical inputs and soil fertility build up. The institute has pioneered research on makhana (*Euryale ferox* Salisb.) cultivation and developed the first ever variety "Swarna Vaidehi". Traditionally, makhana is cultivated in stagnant water bodies having water depth of 1.8 to 2.4 m. However, it has been made possible to grow this crop in a cropping system mode and varietal development in makhana also has been initiated. Further, diversification in aquatic crops is also priority research area of the institute. In the field of agro-biodiversity conservation, 118 germplasm of mango, 32 of jackfruit and 232 of tuber crops were collected, evaluated and conserved at the institute. In addition, germplasm of various multi-purpose trees and the bamboo species is being maintained. Varietal development in water chestnut, vegetables crops such as tomato, brinjal, chilli, capsicum, bottle gourd, ridge gourd, bitter gourd etc., is one of the cardinal activities of the institute. Keeping in view of the diverse agroclimatic conditions, latent opportunities for agricultural development, and resource endowments, the research priorities need to be re-oriented to achieve the target of food and nutritional security with equity. With changing time, the institute will be facing a dynamic and changing environment. Capacity building would be as one of the key initiatives to ensure the quality of highly effective human capital so as to maintain the performance with social commitment in agricultural growth.

Research Highlights

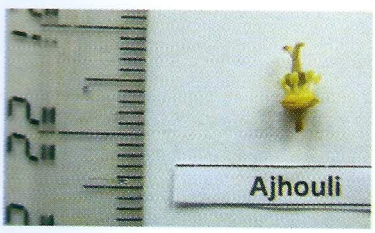
Mapping Population (RILs) for Submergence Stress Tolerance in Rice Evaluated

The mapping population derived from diverse parents IR64 and FR13A, comprising of 217 F4 recombinant inbred lines (RILs) were evaluated under submergence stress environment along with parents. Stress was imposed on vegetative stage (25 days old seedling) for two weeks. Results showed that 138 recombinant inbred lines were found tolerant to submergence for 10 days. Further confirmation of submergence tolerance was based on the use of polymorphic SSR markers (RM 553, RM 5515, RM 257, RM 410, RM 552, RM 222, RM 5349, RM 28755 and RM 216) linked to different submergence related characteristics.

F4 breeding population under water stress (submergence) field condition

DUS Testing in Litchi Developed

Out of the 34 characters identified for DUS characterization of litchi, characters like young leaf colour, leaflet blade shape, leaf margin curvature, length of paracladia, time of opening of male flower, flower disc colour of hermaphrodite flowers, fruit shape, time of fruit maturity and seed shape were recorded to be consistent for distinguishing the litchi genotypes. Based on the distinct descriptor states, the example varieties of litchi have also been identified.



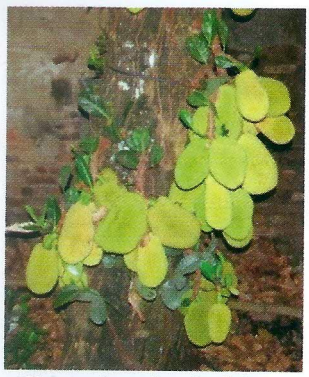
Cream coloured flower disc in hermaphrodite flower of Ajhauli

Pink coloured flower disc in hermaphrodite flower of Green

Plant Genetic Resource Management

Jackfruit

A total number of 32 promising genotypes comprised of nine pink fleshed and eight Baramasi type were collected from Tripura and conserved in the field gene bank of the institute. Based on overall performance, the jackfruit genotype ICAR RCER JS-2/7 was found to be the most promising for fruit quality (Medium sized and cylindrical shaped fruit having > 70% pulp content, TSS > 20°B and fibreless flakes with pleasant flavour).



Cluster bearing jackfruit genotype in Tripura

Mango

A total number of 118 mango genotypes were evaluated for fruit quality and yield. Based on fruit quality parameters (fruit weight > 200g, pulp content > 70%, TSS > 18°B and TSS: acidity > 200), and yield (>45 kg/tree in case of 20 years or more tree age), the genotypes Jardalu, Lucknow Safeda, Goa Bundar, Neeleswari were found promising. Of the 26 numbers of mango hybrids released from different parts of the country, Manjeera, Mulgoa and Neeluddin were found promising for hill and plateau region. Of the 20 commercial varieties from different parts of the country, Himsagar was found to be the most promising with respect to fruit yield and quality (fruit wt. > 250 g, pulp content >70%, TSS >19°B and yield > 80 kg/plant of age 33 years).

Mango hybrid Manjeera found promising for fruit quality and yield

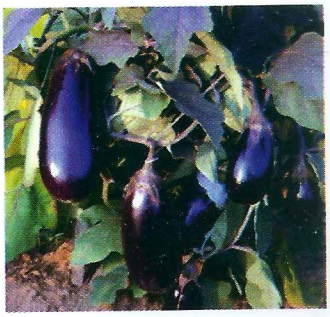
Tuber crops

A total number of 232 germplasm were collected from different parts of Jharkhand, Chhattisgarh, Odisha and West Bengal; and multiplied in the field for further characterization and evaluation. These include germplasm of *Dioscorea* spp. (62), *Ipomoea batatas* (10), *Maranta arundinacea* (1), *Colocasia* spp. (81), *Amorphophallus* spp. (48), *Alocasia* spp. (18), *Manihot* spp. (7) and *Cucumis melo* var *agrestis* (5).

Germplasm of different tuber crops in experimental plot

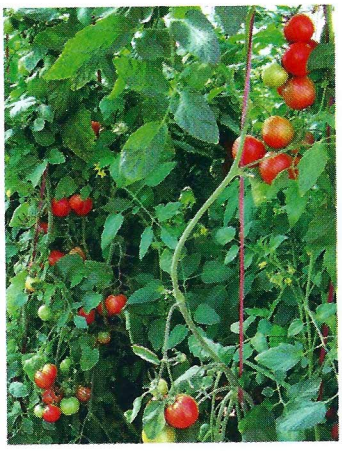
Varieties Released

Brinjal: HABR-21



Description:
Fruit length: 18-20 cm,
Fruit width: 7-8 cm,
No. of fruits/plant: 10-12;
Fruit weight: 300-350g;
Yield/plant: 2-3 kg;
Yield/ha: 55-60 t.

Tomato: Swarna Anmol



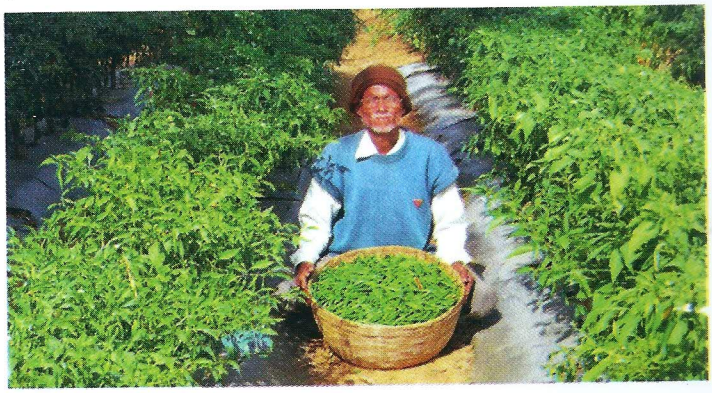
F_1 hybrid, developed by heterosis breeding, for protected cultivation in Jharkhand, Bihar and adjoining areas where bacterial wilt is a problem. Fruits are round, red, with light green shoulder and borne in clusters of 5-6.

Description: Fruit weight : 60-70g, TSS 4.5-5.0°brix, acidity 0.30-0.35% and ascorbic acid 40-42 mg/100 g fruit were observed. Average yield 159.5 t/ha.

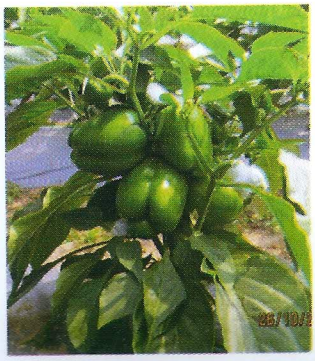
Chilli: Swarna Praphulya

Developed through pure line selection from local germplasm for cultivation in Jharkhand, and Bihar.

Description: Plant height: 90-100 cm, resistant to bacterial wilt under natural field conditions. Fruits are long (6.0-6.5 cm), pungent, dark green and dark red when ripe. Average yield 22.59 t/ha.



Capsicum: Swarna Atulya



Developed through pureline selection

Description: Plant height: 45-50 cm, early flowering and fruiting and suitable for *kharif* and *rabi* cultivation, tolerant to powdery mildew. Fruits (90-100g) are almost round (4.5-5 .0cm length, 5.5-6.0 cm breadth), green and are yellow coloured at maturity. Average yield: 43.46 t/ha.

Bitter gourd: Swarna Yamini

Developed through hybridization followed by pedigree selection.

Description:

Plant is vigorous with 2.5-3.0 m vine length, early flowering and fruiting and suitable for rainy season crop. It is tolerant to powdery mildew and downy mildew. Fruits (65-70 g) are dark green with deep tubercles. Average yield: 19.39 t/ha

Ridge gourd: Swarna Sawani

Developed through pureline selection from local collection.

Description: Plant is vigorous with 3-4 m vine length early flowering and fruiting and suitable for rainy season crop. Tolerant to powdery mildew and downy mildew. Fruits (35-45 g) are borne in clusters with 6-8 fruits per cluster.

Average yield: 30.41 t/ha.

Bottle gourd: Swarna Sneha

Developed through pureline selection. Plant is vigorous with 4-5 m vine length early flowering and fruiting and suitable for rainy season crop. Tolerant to powdery mildew and downy mildew. Fruits are long (30-35 cm length), Average yield: 53.93 t/ha .

Makhana: Swarna Vaidehi

First ever variety of makhana.

Description:
Average yield: 2.8-3.0 t/ha which is 60% higher than the local check.

Drought Tolerant Rice Genotypes Evaluated

Of the 10 rice genotypes having drought tolerance traits evaluated in rice-sugarcane cropping system at Harinagar, West Champaran (Bihar), genotypes *viz.*, IR83373-B-B-25-3 (5.32 t/ha), IR83373-B-B-24-3 (4.54 t/ha), IR83387-B-B-110-1 (4.31 t/ha), IR84895-B-127-CRA-5-1-1(4.67 t/ha), IR83376-B-B-24-2 (3.89 t/ha), Sahbhagi (4.60 t/ha) and Shusk Samrat (4.23 t/ha) were found promising.

Transfer of Technology

Technology Outscaling for Sustainable Food Production and Livelihood Improvement

Interventions on multi-tier cropping system, introduction of improved crop cultivars, Integrated Faming System Model with integration of poultry, fish and agri-horti crops, trenches-cum-raised bed system for fishery and horticulture, waste recycling through vermicomposting, livelihood support system through goatry and poultry were initiated in different clusters of Patna district; and composite fish culture, integrated fish farming with duck, goat and horticulture, quality fish seed production through participatory mode, development of quality brood stock have been initiated at Jandaha and Sarairanjan for improving productivity of chaurs. Cryo-preservation technique was applied to produce quality fish seed for production of brood stock. About 45,000 fish fries were produced from this technique at Jandaha. Similarly, average fish production of 1.04 t/ha was obtained in 10 nos of ponds in Jandah cluster.

Waste recycling through vermicomposting at Beerpur and Sarairanjan

Livelihood support through 'Divyan red' breed of poultry

Livelihood Sustainability through Lac Cultivation

Training was imparted to 54 households for scientific method of lac cultivation and 400 kg of brood lac was provided to the beneficiaries. After one year, total lac production of 2,906 kg was obtained in the month of July 2013. Out of this 2,741 kg was re-inoculated by the farmers in 226 of Kusum and 140 nos of Ber trees. This has significantly increased the average annual income from Rs. 4,653 to Rs 14,040 per household/yr through lac cultivation alone.

Collection of scrap lac

Livelihood Sustainability through Duck Farming

A total of 11 households interested in duck farming were given the 100 number of birds of 'Khaki Campbel' breed. The average body weight gain of female and male duck was 1.60 and 2.24 kg, respectively. A total of 1184 nos of eggs were obtained. The total income from sale of egg and duck meat was recorded to be Rs. 12,303/-. After one year of intervention by the institute in Saraitoli village, average annual income of the household increased to Rs. 54,271/-.

Livelihood Sustainability through Poultry

A total of 14 households interested in poultry were given 152 numbers of chicks of the poultry breed 'Divyayan Red'. At present, a total of 101 (30 female and 71 male) poultry are being reared by the households. An average body weight gain of female bird was 2.54 kg and male bird was 3.6 kg. The total gross income of Rs. 34,642/- was obtained from sale of egg and meat by these households.

Farmers-Scientists Interaction in Bali Island, Sundarban

The Bali island covers an area of 20 km^2 with a population of 35000. Two farmers-scientist interactions were organized by ICAR-RCER. Various vegetable seeds like Swarna Lalima (Tomato), Swarna Shymali (Brinjal), Swarna Praphulya (Chilli), cucurbitaceous seeds (Cucumber, Ridge gourd, Sponge gourd, Pumkin, Biter gourd and Botle gourd) of ICAR-RCER, RC, Ranchi and Azad (Mung bean) were distributed to 100 farm families and package of practices of these varieties were briefed to them.

Demonstration of Vegetable Cultivation

The improved method of vegetable cultivation was demonstrated in the 713 farmers' feld in Jamtara and Dumka districts of Jharkhand. The maximum annual net income of Rs. 2544/- was obtained by a marginal farmer through cultivation of summer and *kharif* vegetables in 1.0 decimal (40m^2) area of backyard garden. Pointed gourd, a perennial cucurbit was introduced as a new crop in NAIP area in three farmers' fields and its cultivation was found to be remunerative. After undergoing training on vegetable seed production at ICAR RCER Research Centre, Ranchi, Sh. Churamani Prasad Yadav started production of pure seeds of improved varieties of vegetable crops in his own field. He could able to sell pure seeds of brinjal (560 g), bottle gourd (1300 g) and cucumber (1020 g) in local village markets (*haats*) and to 6 farmers of 3 villages of Jama block of Dumka district.

Women Empowerment and Drudgery Reduction

Farm women play an important role in agriculture. To reduce their drudgery and to empower them, improved farm implements were introduced and women were trained in mushroom production and value addition in fruits and vegetables. Out of 247 tribal women farmers 128 were engaged in oyster mushroom cultivation in NAIP villages which indicated adoption rate of 51.81%. Twelve women of Gulab Baha SHG of Karela village of Jama block of Dumka district produced the maximum of 678.85 kg oyster mushroom from 446 inoculated bags which was sold @ Rs.120-130/kg valuing the produce at Rs.83146/-. The farm women were also trained in preparation of mushroom pickle, tomato sauce and jack fruit pickle and papad making. They are producing pickles and sauce at their homes and selling the products in local village markets and line hotels.

Commercialization of Makhana

Processing technology for production of "Dried Instant Swarna Mushroom Soup Mix" has been transferred on non-exclusive basis for commercial production to M/s Natural Resources Integrated Development Foundation, Durga College Complex, Shop No. 10, 1st Floor, Maudhapara, Raipur, Chattisgarh-492001. Swarna Vaidehi variety of makhana seed (486 kg) was distributed among farmers, KVKs, CFTRI Mysore, CIPHET, Ludhiana and fishery deptt, Faizabad.

Events Organized

Model Training Course on Gender Perspective in IFS

A model training course on "Gender Perspective in Integrated Farming System" sponsored by Directorate of Extension, DAC, Ministry of Agriculture, New Delhi was organized by the ICAR Research Complex for Eastern Region, Patna from 17-24 January 2013. Smt. Harjot Kaur, Managing Director, COMFED, Patna, inaugurated the programme. The training emphasised on demand driven capacity building of extension and marketing managers of the state, KVKs and SAUs. Twenty five officer participants from State Department of Forestry, Dairy Development, Animal Husbandry & Fisheries and SMS from KVKs got hands-on-learning experience through this capacity building programme. Visits of important technological sites like Integrated Farming System Models, Solar Energy Technology, Fisheries and Animal Farm, Weather Station, Phone-In-Live Programme etc., were arranged for visibility of technologies.

Training-cum-Workshop on Real Time Mango Pest Surveillance

Two days training-cum-workshop on "Real Time Pest Surveillance of Mango Pests" was organized during 7-8 March, 2013 at ICAR RCER, Research Centre, Ranchi. The programme was participated by PIs, Co-PIs, RAs, SRFs and data entry operators from lead centre as well as all cooperating centres (NCIPM, New Delhi; IIHR, Bengaluru; CISH, Lucknow; FRS, Sangareddy; RFRS, Vengurle and AES, Paria). This programme was organized under NICRA funded project on "Understanding the changes in host-pest interactions and dynamics in mango under climate change scenarios".

Agri Summit-2013

The Agri Summit 2013: A Step Towards Second Green Revolution, was inaugurated by Sh. Narendra Singh, Hon'ble Agriculture Minister, Govt. of Bihar on April 8, 2013 at ICAR Research Complex for Eastern Region, Patna. It was attended by Dr. R. S. Paroda, Chairman, Haryana Kisan Ayog and former DG, ICAR; Sh. Niraj Kumar Babloo, MLA, Bihar Legislative Assembly; Sh. Alok Kumar Sinha, Agriculture Production Commissioner, Govt. of Bihar; Dr. A. K. Singh, Vice Chancellor, Rajmata Vijayaraje Sindhiya University, Gwalior; Dr. H. S. Gupta, Director, IARI, New Delhi; Prof. Anwar Alam; Dr. Abidi; various representatives of State Govts from all the eastern states of the country, representatives of ICAR institutes of around 27 institutions of eastern region, Dr. B. P. Bhatt, Director, and all the scientists of CAR-RCER, Patna. The summit was organized to discuss necessary measures for bringing second green revolution from eastern states of the country.

During the summit, Dr. R.S. Poroda said that the second green revolution definitely will come from the eastern region. He also opined that ushering second green revolution, all the three cradles-policy support and political will, Institutional support for developing capable human resources and new innovation/ technology are required to be strengthened. He stressed on reorientation in agriculture from cropping system mode to farming system mode and diversification in agriculture for increasing per unit productivity. Dr. Paroda also said that hybrid maize, micro irrigation and protected cultivation will play an important role in bringing 2nd green revolution in eastern region.

Farmers' Fair-cum-Training Programme on Makhana Cultivation

A farmers fair-cum-training programme on "Improve cultivation techniques in Makhana" at ICAR Research Complex for Eastern Region, Makhana Research Centre, Darbhanga was organized on 16th September, 2013.Shri Tariq Anwar, Hon'ble Union Minister of State for Agriculture and Food Processing Industries inaugurated the programme. Around 1250 farmers, representatives from SBI, NABARD, KVKs, NGOs participated in the training programme. Seven makhana growing progressive farmers from Darbhanga, Madhubani and Katihar districts were also felicitated on this occasion.

Summer School on Horticulture

Summer school on "Horticulture based diversification options for livelihood security in tribal areas" was organized at ICAR RCER Research Centre, Ranchi for 21 days from 21st May to 10th June, 2013.

Training on Dendrobium Orchid Cultivation in Jharkhand

One day training programme on Dendrobium orchid cultivation was organized at ICAR Research Complex for Eastern Region, Ranchi Centre on 26th September 2013. The details of production technology of Dendrobium cultivation was described with demonstration to the farmers' of Jharkhand

Review Meeting of ICAR Institutes and Regional Centres of Bihar

A review meeting of ICAR institutes and regional centres of Bihar was organized by the institute on 3rd August, 2013. Shri Tariq Anwar, Hon'ble Union Minister of State for Agriculture and Food Processing Industries, Govt. of India reviewed the activities of ICAR Institutes and Centres located in Bihar. Hon'ble Minsiter urged the scientists to work for the betterment of small and marginal farmers in respect of food security, profitability and sustainability. He asked the scientists to join hands with the state department in dissemination of technologies developed by the institutes.

ICAR-Industry Meet

The institute organized ICAR-Industry Meet at its research centre, Ranchi on 16th November, 2013, in collaboration with Indian Institute of Natural Resins and Gums (IINRG), Ranchi; Birsa Agricultural University (BAU), Ranchi and Zonal Technology Management Unit, Kolkata. The technologies regarding low energy water

application, Instant Swarna Mushroom Soup Mix and Elite line of capsicum HACAV 271 were also displayed in the exhibition. Improved varieties of diferent crops developed by ICAR-RCER *viz.*, Swarna Vaidehi in makhana, Swarna Anmol in tomato, Swarna Prafulya in chili, Swarna Atulya in capsicum, Swarna Sneha in bottle gourd, Swarna Yamini in biter gourd were also released by the Institute Variety Release Commitee of ICAR RCER. Swarna Vaidehi is the first variety of makhana to be released in the country.

Showcasing of Agricultural Technologies

The two-day programme on Showcasing of "Agricultural Technologies 2013" was jointly organized by the ICAR-RCER and DKMA at ICAR Research Complex for Eastern Region, Patna during 6-7 December, 2013. The programme was inaugurated by Dr. Mangala Rai, Agricultural Advisor to Chief Minister, Govt. of Bihar. The programme was attended by the SAUs, ICAR institutes, KVKs and CGIAR institutes. More than one thousand farmers, farm women, entrepreneurs, extension workers, development functionaries from different parts of eastern region participated and shared their rich experiences during the function. On the occasion, 70 farmers and agri-entrepreneurs from the eastern states were felicitated for their significant contribution in the field of agriculture and allied sectors.

Consultancy, Patents and Commercialization of Technology

"Processed technology for production of dry instant soup mixes from mushrooms" was transferred to M/s Natural Resources Integrated Development Foundation, Maudhapara, Raipur, Chhattisgarh (buyer). MoU has been signed in Feb, 2013 between Institute and the firm to undertake large scale commercial production and sale of instant Swarna Mushroom Soup Mix.

Selections/Promotions/Transfer/Retirements

Our new colleagues

- Mr. Hari Govind Jaiswal, SMS (Plant Breeding) joined KVK, Buxar on 20th March, 2013 on transfer from KVK, Chiniyalisaur, Uttarkashi, Uttarakhand.
- Mr. Ramesh Chandra Verma, SMS (Horticulture), joined KVK, Buxar on 1st April, 2013 on transfer from KVK, Ranipul, Sikkim
- Mrs. Reshma Shinde joined as Scientist (Soil Science) at ICAR-RCER, RC, Ranchi w.e.f 06.05.2013
- Dr. Reena Kumari Kamal joined on 09.10.2013 as Scientist (Livestock Production and Management)
- Mr. Ravi Chatterjee, joined KVK, Buxar on 25.11.2013 as Stenographer, Gr. III

Transfer

- Mr. Vikas Kumar, Programme Assistant (Computer) joined KVK, Buxar on 26.09. 2013 on transfer from KVK, Deoria, Uttar Pradesh

Promotions

- Dr. Bikash Das promoted to Senior Scientist (RGP 9000, PB-IV) w.e.f 22.06.2012
- Shri Y. N. Pathak promoted to Asst. Chief Technical Officer w.e.f 20.11.2011
- Shri Shashi Kumar Azad promoted to Technical Asst. (Farm) w.e.f 16.02.2011

Retirements

- Dr. D.K. Kaushal, Pr. Scientist & Head w.e.f. 31.01.2013
- Dr. J.P. Sharma, Pr. Scientist w.e.f. 31.01.2013
- Shri Kishori Prasad, T-6 w.e.f. 31.01.2013
- Dr. P.K.Thakur, Pr. Scientist, w.e.f. 28.02.2013
- Dr. Janardan Jee, Pr. Scientist, w.e.f. 31.12.2013

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