

19. Cyanobiocon

- **Microbial Constituents:** *Anabaena laxa*/*Calothrix elenkinii*
- **Type:** Carrier based formulation; 2-5 µg Chlorophyll/g
- **Shelf life:** 06 months at 25°C to 35°C
- **Target crops:** Tomato, cucumber, capsicum, cotton, rice, chickpea and chrysanthemum
- **Method of application:** Seed coating (1.25 kg/ha); soil application (1.25 kg suspended in 500 L water for one ha) or seedling dip (1.25 kg suspended in 25 L water for one ha)
- **Target agroecological zones/states:** Delhi, Punjab, Haryana, Himachal Pradesh, Uttarakhand, Rajasthan, Madhya Pradesh and Maharashtra
- **Validation:** Five years under Centre for Protected Cultivation Technology in vegetables and flower crops at ICAR-IARI, New Delhi; Three years field trials in cotton, at ICAR-Central Institute for Cotton Research, Sirsa and Nagpur; Two years with capsicum and tomato, at ICAR-IARI Regional station, Katrain; okra and cucumber at ICAR-Indian Institute of Vegetable Research, Varanasi Uttar Pradesh; Two years in chrysanthemum and tomato at ICAR-IARI, New Delhi; One year with rice in Ambala District, Haryana
- **Commercialization:** Commercialized in 2015; Registered at Zonal Technology Management & Business Planning and Development Unit, ICAR-IARI, New Delhi
- **Benefits:**
 - ◆ Significant enhancement of plant growth, N and P uptake
 - ◆ Elicits immunity against soil borne fungal diseases
 - ◆ Saves chemical fertilizers up to 30-50 kg N/ha
 - ◆ 10-12% increase in yields



Influence of Cyanobiocon application in chickpea var. Pusa 1103 at ICAR-IARI, New Delhi during 2013-14

Contact:

Director, ICAR-Indian Agricultural Research Institute, New Delhi-110012;
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20. Cyanonutricon

- **Microbial constituents:** *Anabaena torulosa* BF1 (NAIMCC-C-00344), *Nostoc carneum* BF2 (NAIMCC-C-00345), *Nostoc piscinale* BF3 (NAIMCC-C-00346) and *Anabaena doliolum* BF4 (NAIMCC-C-00347)
- **Type:** Carrier based formulation; 2-5 µg Chlorophyll/g
- **Shelf life:** 06 months at 25°C to 35°C
- **Target crops:** Rice, wheat, maize, cotton, vegetables and flower crops
- **Method of Application along with dose:** Seed coating (1.25 kg/ha), soil application (1.25 kg suspended in 500 L water for one ha) or seedling dip (1.25 kg suspended in 25 L water for one ha)
- **Target agroecological zones/states:** Delhi, Punjab, Haryana, Andhra Pradesh, Telangana and Maharashtra
- **Validation:** Five years in rice-wheat cropping system at ICAR-IARI, New Delhi; Two years under Centre for Protected Cultivation Technology in vegetables and flower crops at ICAR-IARI, New Delhi; On-farm trials at KVKs of Andhra Pradesh and Telangana in rice; Ambala District, Haryana in rice for two years; One year with cotton at ICAR-Central Institute for Cotton Research, Nagpur
- **Commercialization:** Commercialized in 2015; Registered at Zonal Technology Management & Business Planning and Development Unit, ICAR-IARI, New Delhi
- **Benefits:**
 - ◆ 10–20% increase in grain micronutrients
 - ◆ Saves 30-50 kg N/ha
 - ◆ 10-15% increase in yields
 - ◆ Enrichment of soil carbon



Control- 100% NPK (RDF)



50% N+ 100% P & K + Cyanonutricon

Influence of Cyanonutricon on rice var. Pusa Basmati 1509 at ICAR-IARI New Delhi during 2019

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21. CRIDA Resilia-I

- **Microbial Constituents:** *Pseudomonas putida* P7 (NAIMCC-B-00922) and *Paenibacillus favisporus* B30 (NAIMCC-B-01801)
- **Type:** Carrier based formulation; 1×10^8 cfu/g
- **Shelf life:** 06 months at 25°C to 35°C
- **Target crops:** Maize and rabi sorghum
- **Method of application:** Seed treatment 30 g/kg seeds; soil application 2.5 kg/ha (Mix with 50 kg of well decomposed FYM and apply to one hectare)
- **Target agroecological zones/states:** Punjab, Karnataka and Telangana
- **Validation:** On-farm trials at ICAR-CRIDA, Hyderabad with maize and sorghum for three years; AICRP on Dryland Agriculture at Ballawal Saunkhri, Punjab for three years
- **Commercialization:** Available for licensing
- **Benefits:**
 - ◆ 20-30% increase in yield of maize and rabi sorghum



Control



Treated

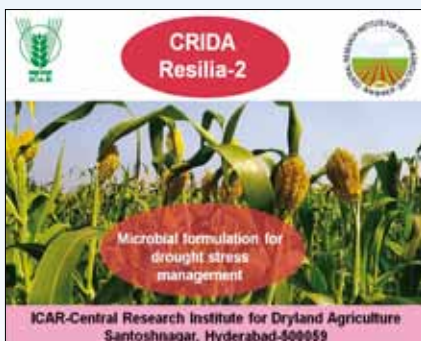
Response of maize var. PMH-1 at Ballawal Saunkhri, Punjab during 2019-20

Contact:

Director, ICAR-Central Research Institute for Dryland Agriculture, Santoshnagar, Hyderabad-500 059; e-Mail: director.crida@icar.gov.in

22. CRIDA Resilia-II

- **Microbial Constituents:** *Pseudomonas putida* P45 (NAIMCC-B-00923) and *Bacillus amyloliquefaciens* B17 (NAIMCC-B-00921)
- **Type:** Carrier based formulation; 1×10^8 cfu/g
- **Shelf life:** 06 months at 25°C to 35°C
- **Target crop:** Sorghum
- **Method of application:** Seed treatment 30 g/kg seeds + soil application 2.5 kg/ha (Mix with 50 kg of well decomposed FYM and apply to one hectare)
- **Target agroecological zones/states:** Maharashtra and Telangana
- **Validation:** On-farm trials at ICAR-CRIDA, Hyderabad with sorghum for three years; AICRP on Dryland Agriculture at Parbhani, Maharashtra for three years
- **Commercialization:** Available for licensing
- **Benefits:**
 - ♦ 15-20% increase in yield of sorghum



Control

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Response of sorghum var. CSV-27 at Parbhani, Maharashtra during 2019-20

Contact:

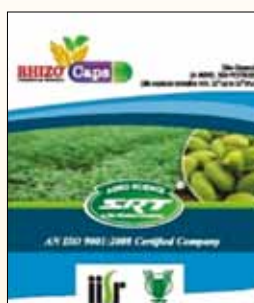
Director, ICAR-Central Research Institute for Dryland Agriculture, Santoshnagar, Hyderabad-500 059; e-Mail: director.crida@icar.gov.in

23. Biocapsules

- **Microbial Constituents:** Capsule can act as a carrier for any bacterial/fungal strain (*Rhizobium*, *Azotobacter*, *Pseudomonas fluorescens*, *Bacillus*, *Burkholderia* and *Trichoderma*)
- **Type:** Capsules; 1×10^{12} cfu/capsule
- **Shelf life:** 12 months at 25°C to 35°C
- **Target crops:** All plantation and horticultural crops
- **Method of application:** Soil drenching using 8-10 capsules per acre; one capsule suspended in 1000 mL water and finally diluted to 100 L
- **Target agroecological zones/states:** All
- **Validation:** Farmers' fields at Kerala, Karnataka, Tamil Nadu, Andhra Pradesh, Maharashtra, Madhya Pradesh, Gujarat, Uttar Pradesh and Himachal Pradesh
- **Commercialization:** Commercialized in 2016; Licensed to two companies
 - ◆ M/s Codagu Agritech, Kudulur, PB No. 58, Kushalnagar-571234, Karnataka
 - ◆ M/s SRT Agro Science Pvt. Ltd. Vill: Funda, Tah: Patan, Durg-491111, Chhattisgarh
- **Benefits:**
 - ◆ Enhances root production, nutrient mobilization and use efficiency, crop growth and yield
 - ◆ Protect crops against soil borne pathogens



Trichoderma sp. and *Bacillus amyloliquefaciens* capsules



Rhizobium and *Azotobacter* capsules

Contact:

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24. Arka Microbial Consortium

- **Microbial Constituents:** *Azotobacter tropicalis* PAN MC1 (NAIMCC-B-01336) (Nitrogen fixer), *Bacillus aryabhatai* Bel 6 (NAIMCC-B-01335) (P & Zn solubilizer) and *Pseudomonas taiwanensis* Mpf2 (NAIMCC-B-01337) (K-solubilizer and PGPR)
- **Type:** Carrier based formulation; 1×10^8 cfu/g of each; Liquid formulation; 1×10^9 cfu/mL of each
- **Shelf life:** 06 months at 25°C to 35°C
- **Target crops:** All annual and perennial horticultural and plantation crops.
- **Method of application:** Seed treatment; biofertiligation through drip lines, soil drenching (3 L/acre or 5 kg/acre)
- **Target agroecological zones/states:** Karnataka, Tamil Nadu, Kerala, Telangana, Andhra Pradesh and Maharashtra
- **Validation:** AICRP on Fruits with guava and papaya for two years; ATARI, Zone VIII for two years on a variety of vegetables; on different horticultural crops at ICAR-IIHR, Bengaluru for three years
- **Commercialization:** Commercialized in 2013; Licensed to 13 entrepreneurs/KVKs/State departments
 - ♦ M/s Bloom Biotech, Chikkamagaluru, Karnataka
 - ♦ M/s Gayatri Hasiru Uddime, Ramnagara District, Karnataka
 - ♦ ICAR-KVK, Hirehalli, Tumakuru District, Karnataka
 - ♦ Department of Horticulture, Bengaluru, Karnataka
 - ♦ M/s Phalada Organics, Bengaluru, Karnataka
 - ♦ ICAR- KVK, Gonikoppal, Kodagu District, Karnataka
 - ♦ M/s Natura Crop Care, Bengaluru, Karnataka
 - ♦ M/s Janardhana, Bengaluru, Karnataka
 - ♦ M/s Bhavani Biochemicals, Koppal, Karnataka
 - ♦ M/s ESAF Swarasya Farmers Producers Organization, Palakkad, Kerala
 - ♦ M/s Ganpath Products, Madurai, Tamil Nadu
 - ♦ M/s JSS Krishi Vigyan Kendra, Mysuru, Karnataka
 - ♦ State Parasite Breeding Farm, Kasaragod, Kerala
- **Benefits:**
 - ♦ Saves 25% of N and P fertilizers
 - ♦ Enhances yield by 10 to 15% in target crops
 - ♦ Net savings of ₹ 1000-3000/ha in target crops
- **Cost:** ₹ 147/- per kg and ₹ 263/- per litre



Contact:

Director, ICAR- Indian Institute of Horticultural Research, Hesaraghatta Lake Post, Bengaluru-560089; e-Mail: director.iihr@icar.gov.in

25. Arka Actino Plus

- **Microbial Constituents:** *Streptomyces viridobrunneus* Pan Act1 (MTCC 11933), *S. bullii* Pan Act2 (MTCC 11934) and *S. griseorubens* Pan Act3 (MTCC 11935)
- **Type:** Carrier based; 1×10^6 cfu/g of each
- **Shelf life:** 06 months at 25°C to 35°C
- **Target crops:** All annual and perennial horticultural and plantation crops.
- **Method of application:** Seed treatment, soil drenching, enrichment of FYM and cocopeat used for raising nurseries and applied at 5 kg/acre. For annual crops it can be applied once during the crop cultivation period, preferably within 10 days of transplantation/sowing. For perennial crops, it can be applied at four monthly intervals with the first application commencing in the month of June/July
- **Target agroecological zones/states:** Karnataka, Tamil Nadu, Kerala, Telangana, Andhra Pradesh and Maharashtra
- **Validation:** Validated through extensive institutional trials at ICAR-IIHR, Bengaluru on a variety of horticultural crops and through the ATARI of Zone VIII in different vegetable crops
- **Commercialization:** Commercialized in 2015; Licensed to two entrepreneurs
 - ◆ M/s Bloom Biotech, Chikkamagaluru, Karnataka
 - ◆ M/s Natura Crop Care, Bengaluru, Karnataka
- **Benefits:**
 - ◆ Saves 25% of P fertilizers
 - ◆ Improves overall plant health
- **Cost:** ₹ 140/kg



Control



Treated

Effect of Arka Actino Plus on vegetable Cowpea (Arka Garima)
at ICAR-IIHR, Bengaluru during 2020-21

Contact:

Director, ICAR- Indian Institute of Horticultural Research, Hesaraghatta Lake Post, Bengaluru-560089; e-Mail: director.ihr@icar.gov.in

26. Kera Probio™

- **Microbial Constituent:** *Bacillus megaterium* (NAIMCC-B-02718)
- **Type:** Carrier based formulation; 10^7 - 10^9 cfu/g
- **Shelf life:** 06 months at 25°C to 35°C
- **Target crops:** Coconut, tomato, brinjal and chilli
- **Method of application:** Seedling dip (mix 500 g in 5 L of water and dip the coconut seedlings for 8-10 hrs); soil application (25 g per plant); for transplanted seedlings booster dose can be given at 50 g per plant; for vegetable crops at 2 kg/acre
- **Target agroecological zones/states:** Kerala
- **Validation:** AICRP on Palms with coconut for 3 years; On-farm trials at ICAR-CPCRI, Kasaragod and farmers' fields, Kasaragod for one year
- **Commercialization:** Commercialized in 2018; Licensed to entrepreneur group of Farmers First Program (FFP) in Pathiyoor Panchayat of Alappuzha district, Kerala
- **Benefits:**
 - ♦ Yield enhancement of 10-12% nuts/palm/year
 - ♦ Incorporation in INM based farming could fetch additional remuneration of ₹ 20000/ha and ₹ 30000-40000/ha if vegetables are taken as intercrop
- **Cost:** ₹ 100/- per kg



Control

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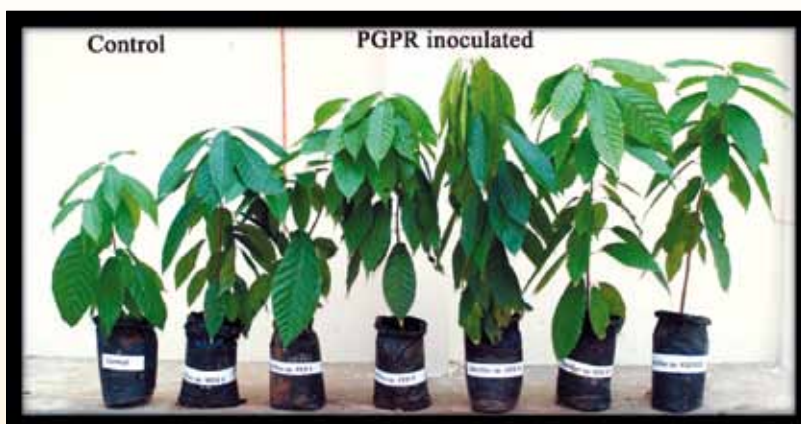
Kera Probio treatment effect on coconut seedlings

Contact:

Director, ICAR-Central Plantation Crops Research Institute, P.O Kudlu, Kasaragod-671124;
e-Mail: director.cpcri@icar.gov.in

27. Cocoa Probio™

- **Microbial Constituent:** *Pseudomonas putida* (NAIMCC-B-02719)
- **Type:** Carrier based formulation; 10^7 - 10^9 cfu/g
- **Shelf life:** 06 months at 25°C to 35°C
- **Target crops:** Cocoa and Vegetable crops
- **Method of application:** Soil application (25 g per plant); for transplanted seedlings booster dose can be given at 100 g per plant; for vegetable crops at 2 kg/acre
- **Target agroecological zones/states:** Kerala, Karnataka, Tamil Nadu, Andhra Pradesh and Telangana
- **Validation:** ICAR-CPCRI farms and farmers' fields of different cocoa growing areas of Kerala, Karnataka, Tamil Nadu, Andhra Pradesh and Telangana for two years
- **Commercialization:** Available for licensing
- **Benefits:**
 - ◆ 50-60% increase in dry matter in seedlings
- **Cost:** ₹ 100/- per kg



Trials with cocoa var. forastero at ICAR-CPCRI, Kasaragod during 2013-14

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Director, ICAR-Central Plantation Crops Research Institute, P.O Kudlu, Kasaragod-671124;
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28. KerAM™

- **Microbial Constituent:** *Claroideoglomus etunicatum*
- **Type:** Carrier based formulation; 100 infective propagules/g
- **Shelf life:** 04 months at 25°C to 35°C
- **Target crops:** Coconut
- **Method of application:** Soil application (50 g/ plant)
- **Target agroecological zones/states:** Kerala, Karnataka, Tamil Nadu, Andhra Pradesh and Telangana
- **Validation:** ICAR-CPCRI farms and farmers' fields in Kerala, Karnataka, Tamil Nadu, Andhra Pradesh and Telangana
- **Commercialization:** Available for licensing
- **Benefits:**
 - ◆ Improves overall plant growth
 - ◆ Better nutrient uptake



Mixing of KerAM with nursery media



KerAM treated coconut seedlings

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