29. NutBoost

- **Microbial Constituents:** *Pseudomonas gessardii* BHU1, *Pseudomonas putida* S1(6) and *Pseudomonas aeruginosa* BM6
- **Type:** Carrier based formulation; 1×10^7 cfu/g of each; Liquid formulation; 1×10^8 cfu/mL of each
- **Shelf life:** 12 months at 25°C to 35°C
- **Target crop:** Groundnut
- **Method of application:** Carrier based: 4 g of formulation to be suspended in 50 mL of water along with 5 g of sugarcane jaggery and then mixed with one kilogram of groundnut kernel; Liquid: 10 mL of bioformulation diluted with 40 mL of water along with 5 g of sugarcane jaggery and then mixed with one kilogram of groundnut kernel
- **Target agroecological zones/states**: Gujarat, Andhra Pradesh, Karnataka, Maharashtra, Telangana, Tamil Nadu, Rajasthan, Odisha, West Bengal, NEH region, Madhya Pradesh and Uttar Pradesh
- **Validation:** ICAR-DGR, Junagadh and farmers' fields, Junagadh for three years; AICRP on Groundnut centres for three years; FLDs for two years in different states
- **Commercialization:** Available for licensing through Agrinnovate India Ltd. (www.agrinnovateindia.co.in)
- **Benefits:**
  - Enhances pod yield in groundnut upto 16 to 18%
  - Saves 30-40% of phosphatic and 25% of potassium fertilizers
  - Saves input cost by ₹ 1000-2000/ha

Effect of NutBoost on groundnut var. JL24 at ICAR-DGR, Junagadh during 2000-01

Contact:
Director, ICAR-Directorate of Groundnut Research, Ivnagar Road, PB No. 5, Junagadh-362001, Gujarat; e-Mail: director.dgr@icar.gov.in

30. NutMagic

- **Microbial constituents:** *Pseudomonas gessardii* BHU1 and *Pseudomonas putida* S1(6) (PGPR); *Enterobacter cloacae* BM8 and *Bacillus* sp. (PSB); *Sinorhizobium americanum* NRCG4 and *Rhizobium* sp. NRCG9 (Groundnut nodulating rhizobia)
- **Type:** Carrier based formulation; 1×10^7 cfu/g of each; Liquid formulation; 1×10^8 cfu/mL of each
- **Shelf life:** 12 months at 25°C to 35°C
- **Target crops:** Groundnut
- **Method of application:** Seed treatment; Carrier based: 4 g of formulation to be suspended in 50 mL of water along with 5 g of sugarcane jaggery and then mixed with one kilogram of groundnut kernel; Liquid: 10 mL of bioformulation diluted with 40 mL of water along with 5 g of sugarcane jaggery and then mixed with one kilogram of groundnut kernel
- **Target agroecological zones/states:** Gujarat, Andhra Pradesh, Karnataka, Maharashtra, Telangana, Tamil Nadu, Rajasthan, Odisha, West Bengal, NEH region, Madhya Pradesh and Uttar Pradesh
- **Validation:** ICAR-DGR, Junagadh and farmers' fields, Junagadh for three years; AICRP on Groundnut centres for three years; FLDs for two years in different states
- **Commercialization:** Available for licensing through Agrinnovate India Ltd. (www.agrinnovateindia.co.in)
- **Benefits:**
  - Pod yield enhancement upto 20%
  - Saves 25-30% of nitrogenous, 30-40% of phosphatic and 25% of potassic fertilizers
  - Saves input cost by ₹ 1000-3000/ha

Control

Treated

Effect of NutMagic on groundnut var.TG3A at ICAR-DGR, Junagadh during 2007-08

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31. NutGrow

- **Microbial constituents:** *Pseudomonas putida* DAPG2, *Pseudomonas putida* DAPG4, *Pseudomonas putida* FP86 and *Pseudomonas fluorescens* FP98
- **Type:** Carrier based formulation; 1×10^7 cfu/g of each; Liquid formulation; 1×10^8 cfu/mL of each
- **Shelf life:** 12 months at 25°C to 35°C
- **Target crops:** Groundnut
- **Method of application:** Carrier based: 4 g of formulation to be suspended in 50 mL of water along with 5 g of sugarcane jaggery and then mixed with one kilogram of groundnut kernel; Liquid: 10 mL of bioformulation diluted with 40 mL of water along with 5 g of sugarcane jaggery and then mixed with one kilogram of groundnut kernel
- **Target agroecological zones/states:** Gujarat, Andhra Pradesh, Karnataka, Maharashtra, Telangana, Tamil Nadu, Rajasthan, Odisha, West Bengal, NEH region, Madhya Pradesh and Uttar Pradesh
- **Validation:** ICAR-DGR, Junagadh and farmers' fields, Junagadh for three years; AICRP on Groundnut centres for three years
- **Commercialization:** Available for licensing
- **Benefits:**
  - Improves pod yield of groundnut by 21%
  - Reduces incidence of collar- and stem- rot by 60%
  - Improves availability of macro- and micro-nutrients (P, K, Mn, Fe, Zn, etc.) by 20-25%
  - Controls nematodes in soil
  - Saves upto 30% of P, K, Zn, Fe
  - Saves input cost by ₹ 1500-2500/ha

Control

Treated

Effect of NutGrow on groundnut var. GG20 at ICAR-DGR, Junagadh during 2011

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Director, ICAR-Directorate of Groundnut Research, Ivnagar Road, PB No. 5, Junagadh-362001, Gujarat; e-Mail: director.dgr@icar.gov.in

32. DroughtGuard

- **Microbial constituent:** *Bacillus firmus* J22
- **Type:** Carrier based formulation; 1×10^7 cfu/g; Liquid formulation; 1×10^9 cfu/mL
- **Shelf life:** 24 months at 25°C to 35°C
- **Target crops:** Groundnut, pigeon pea, cotton and soybean
- **Method of application:** Carrier based: 4 g of formulation to be suspended in 50 mL of water along with 5 g of sugarcane jaggery and then mixed with one kilogram of groundnut kernel; Liquid: 10 mL of bioformulation diluted with 40 mL of water along with 5 g of sugarcane jaggery and then mixed with one kilogram of groundnut kernel
- **Target agroecological zones/states:** Gujarat, Andhra Pradesh, Karnataka, Maharashtra, Telangana, Tamil Nadu, Rajasthan, Odisha, West Bengal, NEH region, Madhya Pradesh and Uttar Pradesh
- **Validation:** On groundnut at ICAR-DGR, Junagadh and farmers' fields, Junagadh (Gujarat), Anantapur and Kalyandurga (Andhra Pradesh), Hiriyur (Karnataka); on soybean at ICAR-IISR, Indore; on pigeon pea at ICAR-IIPR, Kanpur; on cotton and groundnut at CCSRI, Mandvi, Bhuj; on groundnut under rainfed conditions at AICRP-Groundnut centres for three years
- **Commercialization:** Available for licensing
- **Benefits:**
  - Saves 30-40% irrigation water, can give pod yield of 2200-2300 kg/ha with 3-4 less protective irrigations in summer groundnut
  - Under rainfed condition, alleviates drought stress and improves pod yield upto 32%
  - Alleviates drought stress in soybean and pigeon pea and improves yield upto 20%

Control Treated

Effect of DroughtGuard on groundnut var. TG37A at ICAR-DGR, Junagadh during 2015-16

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Director, ICAR-Directorate of Groundnut Research, Ivnagar Road, PB No. 5, Junagadh-362001, Gujarat; e-Mail: director.dgr@icar.gov.in

33. SalGuard

- **Microbial constituents:** *Bacillus firmus* J22N and *Bacillus subtilis* REN51N
- **Type:** Carrier based formulation; 1×10^7 cfu/g of each; Liquid formulation; 1×10^9 cfu/mL of each
- **Shelf life:** 24 months at 25°C to 35°C
- **Target crops:** Groundnut
- **Method of application:** Carrier based: 4 g of formulation to be suspended in 50 mL of water along with 5 g of sugarcane jaggery and then mixed with one kilogram of groundnut kernel; Liquid: 10 mL of bioformulation diluted with 40 mL of water along with 5 g of sugarcane jaggery and then mixed with one kilogram of groundnut kernel
- **Target agroecological zones/states**: Kachchh, Porbandar, Junagadh, Dwarka, Gir-Somnath and Surendranagar districts of Gujarat
- **Validation:** Experimental and farmers' fields at Bhuj, Gujarat
- **Commercialization:** Available for licensing
- **Benefits :**
  - Alleviates salinity stress and improves pod yield upto 18% and haulm yield upto 6%
  - Increases net return by ₹ 15000-16000/-

Control Treated

Effect of SalGuard on groundnut var. TG37A and GG2 at RRS of ICAR-CAZRI, Kukma, Bhuj during 2014-15

Contact:
Director, ICAR-Directorate of Groundnut Research, Ivnagar Road, PB No. 5, Junagadh-362001, Gujarat; e-Mail: director.dgr@icar.gov.in

34. Fytoprost

- **Microbial Constituent:** Metabolic product of a *Rhizobium* sp. (NCIM 5599)
- **Type:** Gel based
- **Shelf life:** 12 months at 25°C to 35°C
- **Target crops:** Sorghum, soybean, maize, brinjal, onion and fenugreek
- **Method of application:** Foliar spray (50 mL/m^2); drip-irrigation system (5-10 kg/ha); seed-treatment/seed-coating (10 g/kg); soil drenching (5-10 kg/ha)
- **Target agroecological zones/states**: Maharashtra
- **Validation:** On sorghum, soybean, maize, brinjal, onion and fenugreek at ICAR-NIASM, Baramati, Maharashtra
- **Commercialization:** Available for licensing
- **Benefits:**
  - Induce rhizosphere colonization by different beneficial microbes such as nitrogen fixers, siderophore producers, and exopolysaccharides producers
  - Promote nodulation in soybean

Control

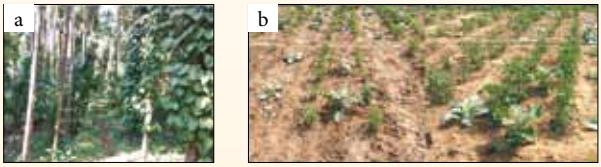
Treated

Effect of Fytoprost on turmeric at ICAR-NIASM, Baramati during 2018-19

Contact:
Director, ICAR- National Institute of Abiotic Stress Management, Malegaon, Baramati–413115; e-Mail: director.niasm@icar.gov.in

35. GoaBio-1

- **Microbial constituent:** *Bacillus methylotrophicus* STC-4 (NAIMCC-B-01890)
- **Type:** Carrier based formulation; 1×10^8 cfu/g
- **Shelf life:** 24 months at 25°C to 35°C
- **Target crops:** Rice, black pepper, fruits, and plantation crop nurseries
- **Method of application:** Rice: Seed treatment at 40 g/kg seed; Nursery application at 50 g/m^2 by pouring the water suspension at 7 and 14 days after sowing; Vegetables: Soil application at 50 g/m^2 in nursery and at 1.0 g/plant (suspend 1 kg in 50 L water and pour 50 mL/plant) while planting or within a week of planting; Black pepper: Soil application at 5 g/cutting in nursery and 50 g/plant while planting
- **Target agroecological zones/states**: Goa, Coastal Maharashtra, Coastal Karnataka and Kerala
- **Validation:** On rice, vegetable crops and black pepper at ICAR-CCARI, Goa for three years
- **Commercialization:** Commercialized in 2019; Available for licensing through Agrinnovate India Ltd. (www.agrinnovateindia.co.in)
- **Cost:** ₹ 300/- per kg
- **Benefits:**
  - Better nutrient mineralization, alleviation of salinity stress, better crop establishment and improved plant growth parameters, yield and soil biological activity
  - 12% increase in grain yield in rice
  - Reduced incidence of soil borne diseases in vegetable crops (40-60%) and foot rot in black pepper (70-80%)



Effect of GoaBio-1 on a) Pepper var. Paniyur-1 at Chorao, Goa b) Chilli var. Nisha at Sangolda, Goa during 2016-17

Contact:
Director, ICAR-Central Coastal Agricultural Research Institute, Old Goa-403402, Goa;
e-Mail: director.ccari@icar.gov.in

36. GoaBio-2

- **Microbial constituent:** *Bacillus methylotrophicus* RCh6-2b (NAIMCC-B-01889)
- **Type:** Carrier based formulation; 1×10^8 cfu/g
- **Shelf life:** 24 months at 25°C to 35°C
- **Target crops:** Brinjal, tomato, chilli, cucumber, black pepper, fruit and plantation crops nurseries
- **Method of application:** Vegetables: Soil application at 50 g/m^2 in nursery and at 1.0 g/plant (suspend 1 kg in 50 L water and pour 50 mL/plant) while planting or within a week of planting; Black pepper: Soil application at 5 g/cutting in nursery and at 50 g/plant while planting
- **Target agroecological zones/states**: Goa, Coastal Maharashtra, Coastal Karnataka and Kerala
- **Validation:** On brinjal, tomato, chilli and black pepper at ICAR- CCARI, Goa and under farmers' fields at Goa for three years
- **Commercialization:** Commercialized in 2019; Available for licensing through Agrinnovate India Ltd. (www.agrinnovateindia.co.in)
- **Benefits:**
  - Improved plant growth parameters, plant health and yield
  - Reduced soil borne disease incidences in brinjal (70-80% bacterial wilt), chilli (40-60% wilt and root rot) and black pepper (70-80% foot rot)
- **Cost:** ₹ 300/- per kg

Control Treated

Effect of Goa Bio-2 on brinjal var. Agassaim at ICAR-CCARI, Goa during 2016-17

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Director, ICAR-Central Coastal Agricultural Research Institute, Old Goa-403402, Goa;
e-Mail: director.ccari@icar.gov.in

37. NRRI-EndoN

- **Microbial Constituent:** *Azotobacter chroococcum* Avi2 (MCC 3432)
- **Type:** Liquid formulation; 1×10^9 cfu/mL
- **Shelf life:** 12 months at 25°C to 35°C
- **Target crop:** Rice
- **Method of application:** Seedling root dip treatment at 500 mL/ha
- **Target agroecological zones/states:** Odisha
- **Validation:** ICAR-NRRI, Cuttack experimental farm for six years; at farmers' fields (30 locations) in Odisha
- **Commercialization:** Available for licensing
- **Benefits:**
  - Saves 25% of chemical N-fertilizers

Control

Treated

Effect of NRRI-EndoN on rice var. Naveen at ICAR-NRRI, Cuttack during 2017-18

Contact:
Director, ICAR- National Rice Research Institute, Cuttack-753006, Odisha;
e-Mail: director.nrri@icar.gov.in

38. NRRI-RhizoN

- **Microbial Constituent:** *Azotobacter vinelandii* SRIAz3
- **Type:** Liquid formulation; 1×10^9 cfu/mL
- **Shelf life:** 12 months at 25°C to 35°C
- **Target crop:** Rice
- **Method of application: :** Seedling root dip treatment at 500 mL/ha
- **Target agroecological zones/states**: ICAR-NRRI, Cuttack experimental farm for six years; at farmers' fields (30 locations) in Odisha
- **Commercialization:** Available for licencing
- **Benefits:**
  - Saves 15-25% of chemical N-fertilizers

Control

Treated

Evaluation of NRRI-RhizoN on rice var. Naveen at ICAR-NRRI, Cuttack during 2018-19

Contact:
Director, ICAR- National Rice Research Institute, Cuttack-753006, Odisha;
e-Mail: director.nrri@icar.gov.in

39. Shatpada Plant growth Booster

- **Microbial Constituent:** *Bacillus megaterium* NBAII EXB53
- **Type:** Carrier based; 1 × 10^9 cfu/g; Liquid formulations; 1 × 10^8 cfu/mL
- **Shelf life:** 12 months at 25°C to 35°C
- **Target crops:** Chilli, capsicum, tomato, brinjal, cauliflower and cabbage
- **Method of application:** Seed treatment (10 g/kg of seeds or 10 mL/kg of seeds)
- **Target agroecological zones/states**: Karnataka
- **Validation:** On-farm trials at ICAR-NBAIR, Bengaluru and commercial nurseries, Bengaluru
- **Commercialization:** Commercialized in 2014; Licensed to Agribiocare, Kottayam, Kerala
- **Benefits:**
  - Increased seedling vigor index in chilli, capsicum, cabbage, brinjal, cauliflower and tomato

Control Treated

Effect on chilli var. Bydagi at ICAR-NBAIR, Bengaluru during 2013-14

Contact:
Director, ICAR- National Bureau of Agricultural Insect Resources, Bengaluru-560024;
e-Mail: director.nbair@icar.gov.in

40. CIARI-Bioconsortia

- **Microbial Constituents:** *Bacillus amyloliquefaciens*, *Lysinibacillus sphaericus* and *Bacillus subtilis*
- **Type:** Carrier based formulation; 1×10^7 cfu/g of each
- **Shelf life:** 12 months at 25°C to 35°C
- **Target crops:** Solanaceous vegetables and flower crops
- **Method of application:** Soil application as bio-enriched FYM; 1 kg to be mixed with 50 kg matured FYM and allowed to get multiplied for one week under shaded field condition with intermittent mixing once in two days; this bio-enriched FYM can be applied in field at 2.5 tonnes/ha; it can be applied throughout cropping season at 20-30 days interval
- **Target agroecological zones/states:** Andaman and Nicobar Islands
- **Validation:** On brinjal and flower crops at ICAR-CIARI, Port Blair, and farmers' fields at Andaman and Nicobar Islands for three years
- **Commercialization:** Available for licensing
- **Benefits:**
  - Promotes growth and yield of brinjal and flower crops
  - Protects plants from bacterial wilt disease

Treated Control

Effect of CIARI-Bioconsortia on brinjal in Andaman and Nicobar Islands during 2015-16

Contact:
Director, ICAR-Central Island Agricultural Research Institute, Port Blair-744101, Andaman and Nicobar Islands; e-Mail: director.ciari@icar.gov.in

41. CIARI-GroPro

- **Microbial Constituents:** *Bacillus amyloliquefaciens*, *Lysinibacillus sphaericus* and *Bacillus subtilis*
- **Type:** Liquid formulation; 1×10^7 cfu/mL of each
- **Shelf life:** 12 months at 25°C to 35°C
- **Target crops:** Vegetable crops
- **Method of application:** Seed treatment at 10 ml/kg seeds; Foliar spray at 5 L/ha at 20-30 days interval
- **Target agroecological zones/states:** Andaman and Nicobar Islands
- **Validation:** On vegetable crops at farmers' fields of Andaman and Nicobar Islands for three years
- **Commercialization:** Available for licensing
- **Benefits:**
  - Enhances plant growth by uniform seed germination, high seedling vigor and uniform plant growth
  - Also acts as effective biocontrol agent against major foliar diseases

Control

Treated

Effect of seed treatment with CIARI-GroPro on brinjal in Andaman and Nicobar Islands during 2015-16

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