

NIRMAL SEEDS PVT. LTD., PACHORA

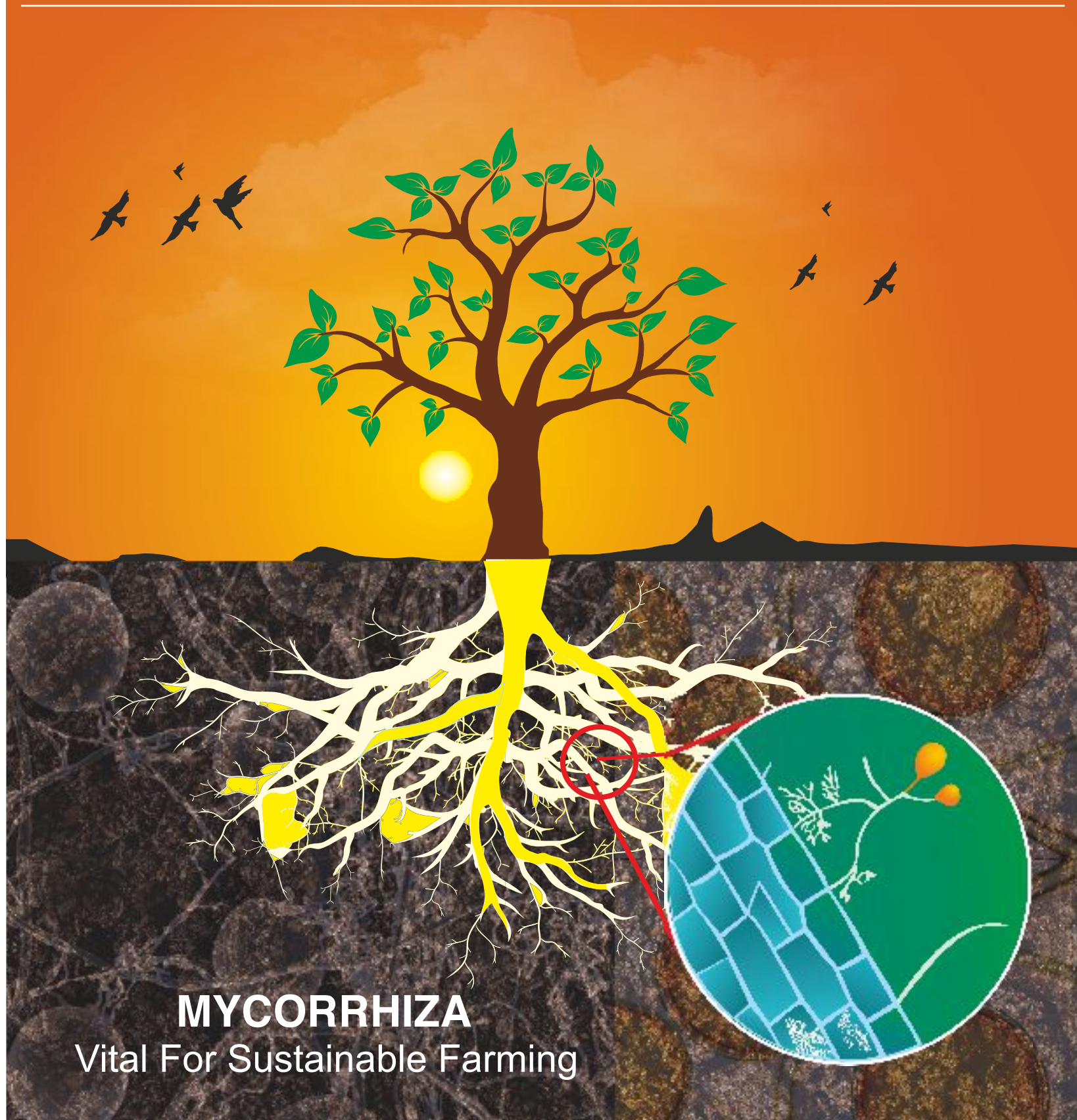


Nirmal Doot



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MYCORRHIZA

Vital For Sustainable Farming



गणतंत्र दिवस के अवसरपर
निर्मल परिवार के सभी सदस्य गण,
वितरक तथा विक्रेता एवं किसान भाईयों
को हार्दिक शुभकामनाएँ !!!

निर्मल परिवार

Gujarat New Plant at Dokwa, Dist : Godhara





कृषी विकास के लिए ठोस पहल की जरूरत है



एस. एस. पाटील



पी. ए. दळवी



रवि चौरपगार

भारत कृषि प्रधान देश है फिर भी खेती हमेशा दुर्लक्षित रही। जिन देशों की अर्थव्यवस्था कृषि पर आधारित नहीं ऐसे देशों में भी खेती की और बहुत ध्यानपूर्वक देखा जाता है। परंतु भारत की अर्थव्यवस्था कृषि आधारित होते हुए भी ध्यानपूर्वक नहीं देखा जाता है यह स्थिति बहुत ही चिंताजनक है।

भविष्यकाल में खेती एवं उससे संबंधित चुनौती इस पर युनो के फुड अँड अँग्रीकल्चर आर्गनायज़ने ने एक रिपोर्ट प्रस्तुत किया। जिसमें लिखा कि मनुष्य जाति की भरण-पोषण की क्षमता खतरे में है। प्राकृतिक साधन - सामुग्री पर दिन - प्रति - दिन बढ़ता बोझ, पर्यावरण में होने वाला परिवर्तन उसके लिए जिम्मेदार है। जागतिकीकरण एवं तकनीकी युग में खेती स्मार्ट बन रही है। खेती का विस्तार हो रहा है। ग्लोबल वार्मिंग की समस्या है। व्यावसायिक कृषी में रसायन जैसे खरपतवारनाशी - कीटनाशी आदी का बेतहाशा प्रयोग किया जा रहा है। फलस्वरूप पर्यावरण का विनाश भी हो रहा है। इसी के साथ बदलते मौसम के परिणाम स्वरूप निर्मित समस्याओं से राह निकालना बहुत मुश्किल हो गया है। इस समस्या को लेकर सारी दुनिया चिंतित है। भारत भी इससे अछूता नहीं है। भूजल का स्तर लगातार गिरता जा रहा है। जैविक वैविध्य खत्म हो रहा है। मिट्टी का उपजाऊ स्तर गिरता जा रहा है जिसके कारण खेती का स्वास्थ्य खतरे में है।

जनसंख्या बहुत तेजी से बढ़ रही है। इस कारण खेती का विकास एवं उत्पाद का विस्तार करना आवश्यक है। कुपोषण खत्म नहीं होगा और अनाज की आवश्यकता बढ़ती ही जाने वाली है। इसी कारण कुपोषण की समस्या भी बढ़ती ही जाएगी। इसीलिए खेती की पारंपारिक पध्दति में क्रांतिकारी परिवर्तन समय की मांग है। प्रकृति एवं प्राकृतिक संसाधनों पर प्रतिकूल प्रभाव डाले बगैर उत्पाद की बढ़ोतरी हमारा लक्ष्य होना चाहिए। खेती का अर्थशास्त्र फसल की पध्दति पर आधारित है। फसल की पध्दति बाजार पर अवलंबित होनी चाहिए। खेती में हर साल, हर बार एक ही एक फसल उत्पाद करने की अपेक्षा उसमें भी वैविध्यता जरूरी है। आज के स्पर्धा के युग में वही टिक सकता है जिसने बाजार को मद्देनजर रखते खेती की। बाजार की माँग के अनुकूल खेती होनी चाहिए। बाजार के नियम सब पर लागू होते हैं। उसके बगैर अर्थव्यवस्था को प्रोत्साहन नहीं मिल सकता। अलग अलग कृषि उत्पन्न बाजार समिति का आज का बाजार मूल्य क्या है इसकी जानकारी उपलब्ध कराने वाली अद्ययावत आधुनिक एवं सक्षम यंत्रणा हमारे पास मौजूद नहीं है। खेती के व्यवसाय में फसल का नियोजन करते समय मौसम के बारे में विचार करना महत्वपूर्ण है। सभी

तहसिल के स्थान पर मौसम के बारे में जानकारी देनेवाले अत्याधुनिक केंद्र होना आवश्यक है। प्रक्रिया उदयोग में बढ़ोतरी, गोदाम एवं शितगृह की संख्या भी बढ़ानी चाहिए।

एम.एस. स्वामीनाथन की अध्यक्षता में राष्ट्रीय कृषि आयोग द्वारा यह सिफारिश की गई कि कृषि विभाग के विकास का दर कृषि विभाग से मिलने वाले उत्पाद पर आधारित हो। परंतु यह दर कृषि उत्पादन पर निश्चित किया जाता है। कृषि उत्पादन में बढ़ोतरी तो होती है किंतु किसान की आय में बढ़ोतरी नहीं होती। यह चित्र बदलना चाहिए। भारत में कुपोषण बहुत बड़ी समस्या है। अगर स्थिति यही रही तो २०५० तक हमारी अवस्था 'भुखमरीग्रस्त देश' हो जाएगी। भविष्यकाल की ओर इंगित इशारे को गंभीरता से लेना जरूरी है। जरूरतमंदों को पोषण आहार मिलना ही चाहिए। किसान सक्षम होना चाहिए, खेती समृद्ध होनी चाहिए और जब तक हम हमारी अर्थव्यवस्था में खेती को प्रथम स्थान नहीं देंगे तब तक कृषि क्षेत्र में क्रांति असंभव है।

भारत की जीडीपी में से १७.३० प्रतिशत हिस्सा खेती का है। दाल की उत्पाद में भारत विश्व में प्रथम स्थान पर है। चावल एवं गेहूँ के उत्पाद में विश्व में दूसरे स्थान पर है इस दृष्टि से भारतीय किसान सब के आकर्षण का केंद्र होना चाहिए किंतु वह निराशाग्रस्त दिखाई देता है। उसके चेहरे पर हास्य नजर नहीं आता। उसका आत्मविश्वास कहीं खो गया है। यह वास्तविकता है फिर इस स्थिति में भारत महासत्ता कैसे बन सकता है यह प्रश्न निर्माण होता है।

भारत की अर्थव्यवस्था का दर पीछले वर्ष की तरह इस वर्ष भी विश्व में अच्छा है। आगामी वर्ष में भारतीय अर्थव्यवस्था जीडीपी के मामले में ब्रिटेन एवं फ्रांस इन दो बड़े देशों को पीछे छोड़ देंगी ऐसा अनुमान लगाया जा रहा है। ब्रिटेन एवं फ्रांस को पीछे छोड़ भारत विश्व की पाँचवी बड़ी अर्थसत्ता बनने का समाचार सुन हमारा मन गर्व से ओतप्रोत होता है। किंतु इस महासत्ता में किसान का स्थान कहाँ है? उसकी बंजर बनती खेती कहाँ है? अगर भारत को महासत्ता बनना है तो खेती व्यवसाय का सक्षमीकरण जरूरी है। किसान सक्षम होना चाहिए। उसकी खेती और उसकी उम्मीद बचाए रखना जरूरी है। खेती के लिए जरूरी सभी मूलभूत सुविधाएं होनी चाहिए। पानी, बिजली एवं खेत खलियानों के रस्ते आदि की व्यवस्था जरूरी है। कृषि इनपुट का दर्जा बेहतर होना चाहिए।

अमेरिका, जापान, फ्रांस इन देशों में खेत की फसल बाजार में आने से पूर्व ही उसका न्यूनतम समर्थन मूल्य (MSP) घोषित हो जाती है। भारत में केवल 8-



किसान सक्षम होना चाहिए, खेती समृद्ध होनी चाहिए और जब तक हम हमारी अर्थव्यवस्था में खेती को प्रथम स्थान नहीं देंगे तब तक कृषि क्षेत्र में क्रांति असंभव है। अगर भारत को महासत्ता बनना है तो खेती व्यवसाय का सक्षमीकरण जरूरी है। किसान सक्षम होना चाहिए। उसकी खेती और उसकी उम्मीद बचाए रखना जरूरी है। खेती के लिए जरूरी सभी मूलभूत सुविधाएं होनी चाहिए। पानी, बिजली एवं खेत खलियानों के रस्ते आदि की व्यवस्था जरूरी है। कृषि इनपुट का दर्जा बेहतर होना चाहिए।

10 फसलों की ही न्यूनतम समर्थन मूल्य घोषित की जाती है। वह भी किसान को नहीं मिलती। यह चित्र बदलना जरूरी है। कृषि क्षेत्र में निर्मित इस समस्या का कारण शाश्वत सिंचन व्यवस्था का अभाव है। इसलिए शाश्वत खेती विकास की दृष्टि से सिंचन व्यवस्था को बढ़ावा देना आवश्यक है। गन्ने का क्षेत्र सुक्ष्म सिंचन व्यवस्था में लाना जरूरी है। ग्रामीण क्षेत्र में कृषि एवं गैर कृषि क्षेत्र में रोजगार की उपलब्धि कराना आवश्यक है। फलों की, फूलों की खेती, वनौषधि उत्पादन, मधुमक्खी पालन, कुक्कुट पालन, मत्स्य पालन इस तरह के खेती से जुड़े व्यवसाय की वृद्धि जरूरी है। कार्पोरेट पध्दति से खेती का नियोजन करना चाहिए। खेती के उत्पाद माल का ब्रँडिंग करना बहुत ही जरूरी है। शाश्वत सिंचन व्यवस्था जरूरी है।

दाल एवं अनाज के उत्पादन में स्वावलंबन होना महत्वपूर्ण है। वर्षा पर अवलंबित खेती को शाश्वत सिंचाई में लाकर उसकी उपज में वृद्धि करना, कृषि प्रसंस्करण उद्योग को प्रोत्साहन देना एवं उत्पादित माल बेहतरीन व्यवस्था निर्माण करना बहुत आवश्यक है। के लिए भारत दुनिया का सबसे युवा देश माना जाता है। इसलिए युवाओं के लिए कृषि क्षेत्र में बड़ी संख्या में रोजगार निर्माण करना चाहिए। इसी के साथ हमारी अर्थव्यवस्था ग्रामकेंद्रित होनी चाहिए। कृषि क्षेत्र के लिए एक स्वतंत्र बजट होना चाहिए। तभी कृषि को समृद्धि मिलेगी। अच्छे दिन आएंगे।

संपादक: एस.एस.पाटील, पी.ए.दलवी, रवि चौरपगार

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◆ CMD's message



किसानों के समृद्धि में योगदान देना तथा कृषि उत्पादकता को बढ़ाकर देश का विकास करना यही हमारा विजन है और उसी दिशा में हम काम कर रहे हैं। समुचे समाज, राष्ट्र का विकास जिसमें हो, उन्हीं नियमों और सिद्धांतों को लेकर चलना होगा, तभी हम देश में कृषि विकास की जड़े मजबूत कर सकते हैं।



मुझे हमारी गृहपत्रिका निर्मल दूत के माध्यम से आप सभी को सम्बोधित करते हुए बेहद खुशी हो रही है।

नये साल की शुरुआत हुई है। हमारे वितरक तथा विक्रेता, चैनल पार्टनर, किसान भाईयों को तथा निर्मल परिवार के सभी सदस्यों को नये साल की मेरी ओर से शुभकामनायें। और मैं कामना करता हूँ कि, ये नया साल आप तथा आपके परिवार जनों कि लिए प्यार, आनंद उत्साह और समृद्धि लेकर आये।

जमीन को खेती उत्पादन का मुलस्रोत माना गया है। लेकिन आज रासायनिक खादों का असंतुलित इस्तेमाल करने से विश्व की मिट्टी जहरीली बन गयी है। भूमिका स्वास्थ्य बिगड़ गया है। इसकी उपजाऊ क्षमता खत्मसी हो रही है। रासायनिक कीटनाशकों के बढ़ते दूषणभाव के कारण आज विश्व सेंद्रिय खेती की ओर तेजीसे बढ़ रहा है। हम पिछले ३० वर्षोंसे सेंद्रिय खेती को पोषक जैविक उत्पादों के निर्माण क्षेत्र में कार्यरत है। ऑर्गेनिक फार्मिंग का विचार करते हुए देश में केवल ०.७६ प्रतिशत क्षेत्र में ही सेंद्रिय खेती की जाती है। इसमें वृद्धि करना हो तो हमें सेंद्रिय, जैविक निविष्टाओंपर ज्यादा जोर देना चाहिए। खेती उत्पादन वृद्धि के लिए सुचना प्रौद्योगिकरण, जैवतंत्रज्ञान व नॅनो तंत्रज्ञान का प्रभावी उपयोग करना चाहिए, तब ही देश की अन्न सुरक्षा अबाधित रहेगी।

मित्रों, सेवा ही हमारी प्राथमिकता है। देश के किसानों की आवश्यकता को हमारी आवश्यकता मानकर किसानों की विविध समस्या जानकर उन्हे नये युग के साधन-सामुग्री एवम् उपाय हमने दिये है।

आज के समय की मांग के अनुसार नये बदलाव, नये अनुसंधानों, तंत्रज्ञान को विकसित किया और उसे किसानों तक पहुंचाया। इस उचित कार्य का श्रेय हमारे वितरक, विक्रेता एवम् विपणन क्षेत्र में कार्य करनेवाले हमारे सहयोगी सहकारी, कर्मचारी को निश्चित रूप से जाता है और मुझे इसका सार्थ अभिमान है। निर्मल के बीज एवं जैविक उत्पाद अपनी गुणवत्ता के लिए भारत एवं विश्व स्तर पर अपनी पहचान बना चुके है। खेतों की उत्पादकता तथा किसानों का विकास जैसे लक्ष्यों को प्राप्त करने की दिशा में निर्मल सिडस् की मुख्य भूमिका सर्वज्ञात है। बढ़ती हुई जनसंख्या, जलवायु परिवर्तन, उत्पादन की बढ़ती लागत, उच्च उपजशील किस्मों तथा जैविक उत्पादों की बढ़ती मांग और बायो फोर्टीफिकेशन की आवश्यकता की चुनौतियों का सामना करने के लिए निर्मल सिडस् द्वारा अनेक पहलें की गयी है। किसानों के समृद्धि में योगदान देना तथा कृषि उत्पादकता को बढ़ाकर देश का विकास करना यही हमारा विजन है और उसी दिशा में हम काम कर रहे हैं। किसान को लोकल से ग्लोबल बनाने का हमारा प्रयास है। इसलिए नये नये प्रौद्योगिकियों को प्रस्तुत करते रहे हैं। हमारे अनुसंधान में आमलाग्र परिवर्तन कर नई रणनीतियाँ और उच्च उपजशील किस्मोंका निर्माण किया है।

बदलते परिवेश एवं समय की मांग और साथही किसानोंकी समृद्धी और मृदा की कम होती उर्वरकता को देखते हुए "टेरी" नामक अंतरराष्ट्रीय संस्था द्वारा प्राप्त तंत्रज्ञान के आधारपर माइक्रोराईजल बायो



फर्टिलाइजर (जैविक उर्वरक) निर्मल बायोपॉवर गोल्ड नामसे बेहतरीन और अधिक शक्तीशाली जैविक उत्पाद बनाकर किसानों की सेवा में अर्पित किया है। देश की उन्नती तब होगी जब देश का प्रत्येक नागरीक अपने अपने दायित्वों की ओर ध्यान देगा। अपने उत्तर दायित्वों को सँझे बगैर कोई भी संगठन विस्तार नहीं कर सकता। दायित्वों का निर्वाह करने के लिए हमें अपने रोजमर्रा के कार्यों को जिम्मेदारीसे करना होगा। और उसमे भी पूर्ण समर्पण भाव होना चाहिए।

विश्व में अपने स्वतंत्र अस्तित्व निर्माण के लिए एक संकल्प लेना होगा। तो आज संकल्प ले राष्ट्र विकास का, किसानों की खुशहाली का और उनके प्रति समर्पण का। समुचे समाज, राष्ट्र का विकास जिसमें हो, उन्हीं नियमों और सिध्दांतों को लेकर चलना होगा, तभी हम देश में कृषि विकास की जडे मजबूत कर सकते है।

मुझे पता है कि, हमारे निर्मल परिवार के सदस्यों में ताकत की कोई कमी नहीं है। दुसरों के मुकाबले वोअधिक प्रतिभावान है। मै हमेशा

सकारात्मक तत्वों से प्रेरणा लेता हूँ। इच्छाशक्ति को बढ़ाने के लिए सकारात्मक व सक्रिय मनोभाव एवं प्रगतिशील विचारों से स्वयं को प्रोत्साहीत करना चाहिए। आपका प्रयास व आपकी असली क्षमता को देखकर मुझे पुरा विश्वास है कि, हमारा जो लक्ष्य है उसे प्राप्त करने हेतू सभी एकजुट होकर संयुक्त प्रयास करेंगे, आगे बढ़ते जाएँगे और भारतीय कृषि को प्रगति पथ पर ले जाने में योगदान देते रहेंगे।

आर. ओ. पाटील
चेयरमेन तथा प्रबंध निदेशक



Bio Power Gold- A Unique Mycorrhizal Bio-fertilizer developed by ROC technique for sustainable Agriculture

M. S. Paprikar (Microbiologist)
Valmik M. Patil (Research officer)
Vijay M. Patil (Sr. Biotechnologist)

The word Mycorrhizae is derived from the Greek words, “Mykes” meaning fungus and “Rhiza” means root. A Mycorrhiza is an anatomical structure that results from a symbiotic association between a soil fungus and plant roots. In India, renowned Research Institute the Energy and Resources Institute (TERI) has developed and patented the unique in vitro production and multiplication method of Mycorrhizae.

Brief about TERI

- TERI is a leading think tank dedicated to conducting research for sustainable development of India and the Global South.
- TERI was established in 1974 as an information Centre on energy issues. However, over the following decades, it made a mark as a research institute, whose policy and technology solutions transformed people's lives and the environment.
- TERI's key focus lies in promoting: Clean energy, Water management, Pollution management, Sustainable agriculture and Climate resilience

The Nirmal Seeds have entered in Research tie up with TERI for mass multiplication of Mycorrhizae by a high tech and hygienic root organ culture. Accordingly TERI has signed technology transfer agreement with NSPL. NSPL is in process to establish its own class 10,000 laboratory facilities at Pachora, which will be completed till August 2018. Till then TERI's facilities are being utilized for production of Mycorrhizae.

Nirmal Seeds have introduced a new Product based on TERI's technology with brand name “Bio Power Gold” (Arbuscular Mycorrhiza) (*Glomus* spp.) It is recommended @10 kg/ acre and shelf life of the product is 2 Years.

The product is based on Arbuscular Mycorrhizal (AM) fungi. It contains the spores (asexual resting Chlamydospores), fragments of Mycorrhizal fungal filaments and infected roots bits. It is a consortium of three species of *Glomus* (AM Fungi) multiplied by an innovative method of root organ culture technique. *Glomus* species used in Bio Power Gold are viz, *Glomus intraradices* (*Rhizophagus irregularis*), *Glomus etunicatum* (*Claroideoglomus etunicatum*) and *Glomus proliferum* (*Rhizophagus proliferus*)



Advantages of AM by ROC technique over conventional method of production.

- Developed with patented ROC techniques using three species (consortium) of *Glomus*.
- High-tech in vitro production technology under controlled hygienic conditions.
- ROC technique offers pure, bulk, contaminant free propagules production in minimum time period.
- Very Effective (Granular formulation)-It reaches uniformly near root zone. Completely water dispersible.
- Easier application- Broadcasting can also work. Due to free flowing nature uniform spread of propagules is possible unlike powder form.
- Shelf life- 2 years. Due to porous nature, propagules are safely carried till the shelf life of the product.
- Granular formulations make the more air permeability and enhance water holding capacity.
- Granular formulations are also effective in waterlogged conditions as granules particles settles into root zone.
- Granules used as carrier are having natural sources of potassium, phosphorus, silicon, Calcium and magnesium, free from toxic elements.



Mode of Action: - Mycorrhizae are obligate and saprophytic in nature which are totally biotrophic and hence, requires a living host for its survival.

Endo-Mycorrhizae of which Bio Power Gold is prepared contain Arbuscular Mycorrhizae (AM-fungi) which are part of soil biota and present universally in the soil. The Bio Power Gold by associating symbiotically with root of the plants, helps in the greater absorption of phosphorus, water and other important macro and essential micro elements and making them available to the plants in an easily usable organic form. AM fungi produce the glycoprotein glomalin which may be one of the major stores of carbon in the soil, management. AM fungi enhances phosphate uptake and mobilize immobile micronutrients like Fe, Mn, Zn, Cu, Bo, Mo.

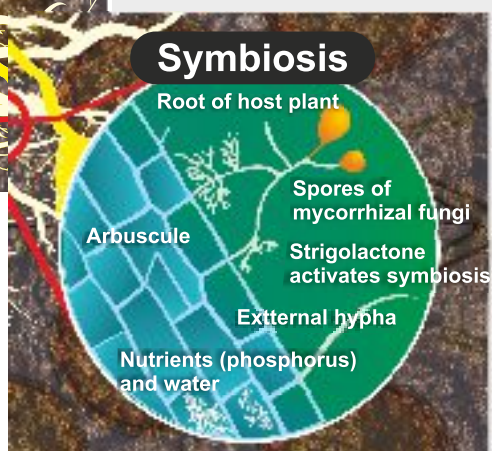
The structure of the arbuscules increases the contact surface between the hyphal and the cortical cell cytoplasm to facilitate the transfer of nutrients between them. In a small portion of soil, the root system is associated with several miles of AM fungal filaments. These filaments release powerful chemicals in the soil that dissolves hard to capture nutrients and absorb nutrients from untapped areas of soil. Due to increase in the surface absorbing area of roots there are 100 to 1000 times increases in nutrient uptake ability of the plants. Fungal filaments also absorb, store and supply available soil water to roots even in drought conditions and imparts drought resistance to crops.



Apart from this, Mycorrhizal Bio fertilizers are also reported to have an inhibitory effect on plant/soil borne fungal pathogens, nematodes and reduction in disease severity.

Torres-Barragán et al, 1996, reported delayed disease epidemic of white rot causing pathogen *Sclerotium cepivorum* and an increase in yield by 22 % in AM treated *Allium cepa* (Onion). In *Cajanus cajan* AM treated plants are observed inhibitory effect on the development of diseases due to *Phytophthora*

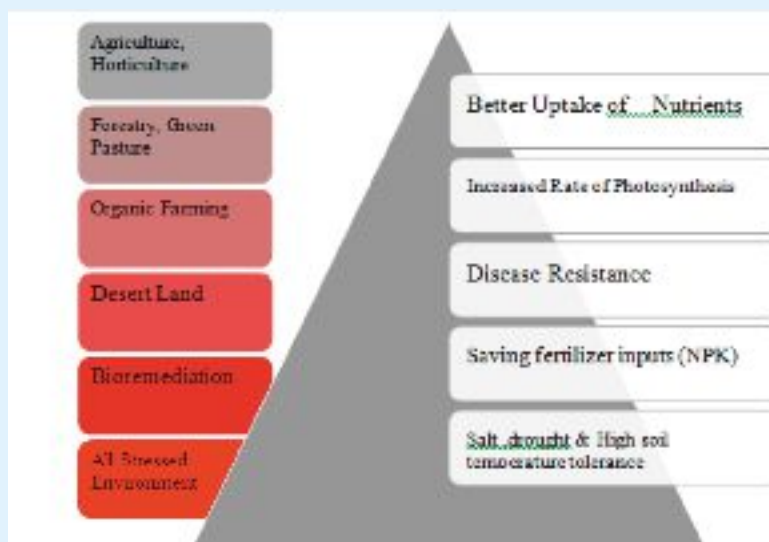
drechsleri. *F.sp.cajani*. Plant growth was improved as per work of Bisht et al, 1985. Krishna and Bagyaraj., 1983 finds. Ground nut, treated with AM fungi observed reduction in the severity of disease due to pathogen *Sclerotium rolfsii*. AM fungi (*Glomus intraradices*) also found effective in control of *Fusarium oxysporum f.sp.radices-lycopersici* in tomato as per reference of Caron et al. 1986 b,c. Khadge et al, 1990 observed that, AM treated Rice plant could control of *Rhizoctonia solani* and increase in root dry mass.



AM treated (*Glomus etunicatum*) *Allium cepa* developed tolerance against Plant pathogenic nematode *Meloidogyne hopla*, *Meloidogyne incognita* as observed by Verdejo et al, 1990.

Features:

1. Helps to absorb and mobilize primarily phosphorus along with other important macro and micro elements and water.
2. Compatible with other Bio fertilizer of different categories (N, P, K and S - fixers and solubilizers).
3. Gives protection to the plants from pathogenic fungi and nematodes causing damage to the roots. It is due to both the physical effects of a Mycorrhizal - produced chitinous cell wall covering and certain chemical effects such as antibiotic exudates
4. Environment friendly and does not affect ecological balance.





Benefits of Bio Power Gold (Mycorrhizal bio fertilizer) to the crop and soil:

1. Improve plant root growth and development.
2. Increase the uptake and mobilization of phosphate in all crops.
3. Increase and facilitate nutrient and translocation from the soil and root cuticle parenchyma to xylem, Phloem, elements like nitrogen, potassium, Iron, manganese, magnesium, copper, zinc, boron, sulfur and molybdenum.
4. Effective in overcoming the stress condition like drought, disease Incidence and deficiency of nutrients.
5. Enhance product quality and increase the immune power of the crop.
6. AM supplement, root hair in water absorption, hence prevents a reduction in crop relative water content of cells and helps to overcome drought.

Recommendations: Bio Power Gold (endomycorrhizae) can be used in annual crops like cereals, pulses, oil seeds and fruit crops but it

cannot be used in cruciferous plants.

From Ongoing observation it is very clear that, Mycorrhizal Bio fertilizers developed by the Consortium of *Glomus* species and propagated by ROC technique shall provide significant high and economically attractive options to reduce dose of chemical fertilizers.

It has become an integral part of Integrated Nutrient Management and indispensable component of Sustainable Agriculture.





Effect of climate change on pest population and pest management

I. S. Halakude

(Research Coordinator)

The effect of climate change on our ecosystems are quite severe and widespread. The climate change is already impacting agriculture and is one of the most daunting challenges facing humankind. While some of the problems associated with climate change are emerging gradually, action is urgently needed to build resilience in agricultural production systems.

Recent studies have indicate that 2 degree increase in temperature will affect agricultural productivity, particularly in the tropical regions. Rise in temperature is largely due to increased concentration of green house gases, which include carbon dioxide (CO₂), Methane (CH₄), Nitrous oxide (N₂O) and chlorofluorocarbons (CFCs). Over the past 200 years, the atmosphere concentration of CO₂ increased by 35% and is expected to double by the end of this century.

Long-term monitoring of pest population levels and behavior, particularly in identifiably sensitive regions, may provide some of the first indications of a biological response to climate change. It will be important to keep ahead of undesirable pest adaptations, and consider global warming and climate change for planning research and development efforts for integrated pest management (IPM) in the future. The temperature increases associated with climatic changes could result in:

- Change in geographical range of insect pests

- Increased overwintering and rapid population growth
- Changes in insect-host plant-natural enemy interactions
- Impact on arthropod diversity and extinction of species
- Changes in synchrony between insect pests and their crop hosts
- Introduction of alternative hosts as green bridges
- Changes in relative abundance and effectiveness of bio control agents
- Change in expression of resistance to insects in cultivars with temperature-sensitive genes

Climate change and pest associated losses

To understand how best to control insect pests and diseases to improve agricultural productivity in the context of climate change, plant protection professionals must work with social change, defiantly it process and influencers to effect change. The insect pest & diseases could potentially deprive over 50% yield losses in major crops and upto 80% of the attainable yield in case of cotton. Insect pests are highly sensitive to climate change, which cause an estimated annual loss of 10-15% globally and the pest associated losses in India have been estimated to be 17.5 % (Dhahiwal et al 2010). Insect pest associated losses are

likely to increase as a result of changes in crop diversity, cropping patterns, cropping intensity and climate change. High mobility & rapid population growth will increase the extent of losses due to insect pests.

Several insect pests, that were important in the past or are minor pests, are becoming more devastating with global warming and climate change. Many insect species, that will move to newer areas as invasive pests and pose a major threat to crop production as they find more suitable climate niches in the new areas.

Effect of climate change on geographic distribution and pest population dynamics

Low temperature are often more important than high temperatures in determining the geographical distribution of insect pests. Increasing temperatures may result in a greater ability to overwinter in insect species limited by low temperature at higher latitudes. There are several examples of changes in the geographic distribution of several insect species as a result of climate change. However, whether or not an insect pest would move with a crop into a new habitat will depend on other environmental conditions such as the presence of overwintering sites, soil type and moisture.

In addition to the direct effect of temperature changes on development





rates, changes in food quality due to plant stress may result in dramatic increases in growth of insect pest population, while the growth of certain insect pests may be adversely affected. Some species might extend their geographic range towards the pole and to higher altitudes. Potential changes in temperature, rainfall and wind patterns associated with climate change.

Sr. No.	Insect Pest	Scientific Name	Crop(s)
1	American bollworm	<i>Helicoverpa armigera</i> (Hubner)	Cotton, Chickpea, Pigeonpea, Sunflower, Tomato etc.
2	Pink bollworm	<i>Pectinophora gossypiella</i>	Cotton
3	Spotted pod borer	<i>Maruca vitrata</i> (Geyer)	Pigeonpea, Cowpea, Beans
4	Pink stem borer	<i>Sesami ainferens</i> (Walk.)	Maize, Sorghum, Wheat
5	Pod sucking bugs	<i>Clavigralla</i> spp.	Pigeonpea
6	Spotted pod borer	<i>Maruca Vitrata</i> (Fabricius)	Pigeonpea, Cowpea
7	Fruit fly	<i>Bactrocera</i> spp.	Fruits and vegetables
8	Thrips	Several species	Groundnut, Cotton, Chillies, Citrus, Pomegranate
9	White fly	<i>Bemisia tabaci</i> (Gen.)	Cotton, Tobacco
10	Leaf miner	<i>Liriomyza trifolii</i> (Burg.)	Cotton, Tomato, Cucurbits, Several other vegetables
11	Dimondback moth	<i>Plutella xylostella</i> (L.)	Cabbage, Cauliflower
12	Brown plant hopper	<i>Nalaparvata lugens</i> (Stal)	Rice
13	Green leaf hopper	<i>Nephotettix</i> spp.	Rice
14	Gall midge	<i>Orseolia oryzae</i> (Wood-Mason)	Rice

Global warming and pest outbreaks

Global warming will result in pest outbreaks. Pest outbreaks are more likely to occur with stressed plants as a result of weakening of plants defensive system, and thus, increasing the level of susceptibility to insect pests. Global warming will lead to earlier infestation by *H. armigera* in North India, resulting in increased crop loss. Many insects such as *Helicoverpa* spp. are migratory, and therefore, may be well adapted to exploit new opportunities by moving rapidly into new areas as a result of climate change.

Recent pest outbreaks in relation to climate change in India

Sr. No.	Insect pest	Host plants	Region/ Location	Probable reasons	Impact
1	Pink bollworm	Cotton	Maharashtra, Gujrat, Karnataka	Abnormal weather condition	30-50%
2	American bollworm	Cotton	Maharashtra, Gujrat, Karnataka	Abnormal weather condition	30-50%
3	Mealy bugs	Cotton, Vegetables	Punjab, Haryana	Hot and dry weather, insecticide misuse	30-40%
4	Plant hoppers	Rice	North India	Abnormal weather condition	Crop failure on >33000 ha
5	Sugarcane woolly aphid	Sugarcane	Karnataka, Maharashtra	Abnormal weather condition	30% yield loss; Reduced cane recovery



Effect of climate change on expression of resistance to insect pests

Host plant resistance to insects is one of the most environmental friendly components of pest management. However, climate change may alter the interactions between the insect pests and their host plants. Resistance to sorghum midge, observed in India. There will be increased impact on insect pests which benefit from reduced host defenses as a result of the stress caused by the lack of adaptation to sub-optimal climatic conditions. The introduction of new crops and cultivars to take advantage of the new environmental conditions is one of the adaptive methods suggested as a possible response to climate change.

The effects of increased atmospheric CO₂ on herbivory will not only be species-specific, but also specific to each insect-plant system. Increased CO₂ may also cause a slight decrease in nitrogen-based defenses (e.g. alkaloids) and a slight increase in carbon based defenses (e.g., tannins). Lower foliar nitrogen due to CO₂ causes an increase in food consumption by the herbivores up to 40%. Maximum larval, pupal weights of *H.armigera* were recorded in insects reared under lower temperature and larval, pupal periods, weight and fecundity were increased with an increase in CO₂ concentration.

Environmental factors such as soil moisture, soil fertility and temperature have strong influence on the expression of Bt toxins in transgenic plants. Possible causes for the failure of insect control may be: inadequate production of the toxin protein, effect of environment of transgene expression, locally resistant insect populations, and development of resistance due to inadequate management. It is therefore important to understand the effects of climate change on the efficacy of transgenic plants for pest management.

Effect of climate change on activity of natural enemies

Relationship between insect pest and their natural enemies will change as a result of global warming, resulting in both increase and decreases in the status of individual pest species. Changes in temperature will also alter the timing of diurnal activity patterns of different groups of insects and changes in interspecific interactions could also alter the effectiveness of natural enemies for pest management. Quantifying the effect of climate change on the activity and effectiveness of natural enemies will be a major concern in future pest management programs. Aphid abundance increases with an increase in CO₂ and temperature, however, the parasitism rates remain unchanged in elevated CO₂. Temperature not only affects the rate of insect development, but also has a profound effect on fecundity and sex ratio of parasitoids. The interactions between insect pests and their natural enemies need to be studied carefully to devise appropriate methods for using natural enemies in pest management.

Effect of climate change on insect pest – natural enemy interactions.

Climatic variability	Crop	Insect pest	Natural enemy	Stage of insect	Potential impact
Decreased rainfall in Sept & Oct	Sorghum	Stem borer	<i>Trichogramma chilonis Ishii</i>	Eggs	Increase
Increased rainfall variability	Castor	Semilooper	<i>Trichogramma chilonis Ishii</i>	Eggs	Decrease
Decreased rainfall in Jun-Sept	Soybean	Leaf eating caterpillar	<i>Telenomus remus</i> (Nixon), <i>Cotesia flavipes</i> (Cam.)	Eggs larvae	Decrease
Increased rainfall events	Groundnut	Leafminer	<i>T. chilonis Tremus C flavipes</i>	Eggs larvae	Decrease 30-40%
Dry weather conditions	Chickpea	Pod borer	<i>Campoletis chloridae</i> Uchida	Larvae	Decrease
Decrease in August rainfall	Pigeonpea	Yellow stem borer	<i>Tetrastichus</i> spp.	Eggs	Up to 100% increase

Finally, we need to adopt and assess the efficacy of various integrated pest and disease management systems that take into consideration the change in pest spectrum, cropping patterns and effectiveness of different components of pest management for sustainable crop production.



Future Scenario of Plant Breeding:

Speed breeding: powerful tool to accelerate crop research

(Source: Journal Nature plants)

Valmik Patil
(Research officer)

Our planet is expected to host an extra two billion people by 2050, but the amount of arable land we have got won't be changing all that much. How exactly we are going to feed all these hungry mouths is a problem and scientists are looking at from every angle, including creating heat resistant cows, vertical farms and lab grown meat etc. Researchers are now reporting an advance in a NASA-inspired field known as "speed breeding" that relies on intense lighting system to raise crops several times faster, and boost their health at the same time. Presently, for most of the crop plants, the breeding of new, advance cultivars, takes several years. This is particularly time consuming for field grown crops that are often limited to only 1-2 generations per year.

A new system called speed breeding, designed to grow six crops a year, in glasshouses to accelerate the process. Using LED lighting to aid photosynthesis, intensive system allow the plants to grow for 22 hours a day. This new form of lighting is very cheaper and also more efficient. Among the crops that can now be grown up to six generations a year are wheat, barley, peas and chickpeas. Canola can achieve four cycles.

Using this technology, scientists can study the way plants deal with diseases, their shape, structure and flowering time and the growing cycle can be repeated every eight weeks. It is hoped that the technique will yield new varieties of crops that can be grown on a commercial scale within next 10 years. If this could be achieved, it would increase productivity in the same way as the green revolution of the 1960s, when new crop varieties, modern farm practices, and use of fertilisers saved millions of people from starvation.



Fig: Speed Breeding under control conditions

(Source: Dr. Lee Hickey Lab, University of Queensland, Australia)

Using the technique, the team of Scientist of University of Queensland and University of Sydney has achieved wheat generation from seed to seed in just 8 weeks. This means that it is now possible to grow as many as 6 generations of wheat every year, a three fold increase on the shuttle breeding techniques currently used by breeders and researchers. This technique uses fully controlled growth environments and can also be scaled up to work in a standard glass house.

Speed breeding platform can

be combined with lots of other technologies such as CRISPR gene editing to get to the end result faster. The speed breeding technique has largely been used for research purposes but is now being adopted by industry. In partnership with Dow AgroSciences, the scientists have used the technique to develop the new 'DS Faraday' protein rich wheat variety which will be released in 2018. This tool is going to be really powerful to speed up the development of our future crops.



Recent updates at Biotech Division of Nirmal Seeds Pvt. Ltd.

Ramdas Raut
(Biotechnologist)

Vijay M. Patil
(Sr. Biotechnologist)

- ❖ Nirmal Seeds is setting up a state - of-the-art class 10000 laboratory facilities at Pachora for hygenic mass multiplication of Mycorrhizae by Root organ culture (ROC) technique.
- ❖ NSPL's Biotech Division has initiated transgenic crop development in *Arboreum* cotton having resistance to insect bollworm using gene sources from IARI, New Delhi.
- ❖ NSPL has successfully developed nutritionally improved DL mustard (*Brassica juncea*) variety (NML-100) with low erucic acid & glucosinolate content. Very soon we are planing to launch DL Mustard hybrids.
- ❖ Recently NSPL's Biotech division has successfully completed DBT, BIRAC supported project entitled "Development of Okra varieties having resistance to YVMV using Marker Assisted Selection" In this project NSPL developed marker for YVMV disease resistance will useful for hybrid development having resistance to YVMV
- ❖ NSPL's Biotech division assisting to breeding team for developing BLB & Blast resistance rice using Marker Assisted Selection and soon Multilocation (MLT) trials will be conducted at hotspots for screening against bacterial blight and blast.
- ❖ NSPL's Biotech division assisting Breeders for development of restorer line in Mustard using Marker Assisted Breeding. We have developed new restorer line in Mustard which can be utilized in F1 seed products using CGMS systems.
- ❖ Recently NSPL's Biotech division has successfully completed DBT, BIRAC supported project entitled "Development of viral resistance okra using RNAi gene construct namely C4hp and AV-1". Using this technique NSPL is developing Okra line for YVMV disease resistance holding RNAi gene construct.





Gene Editing a New Toolbox for Better Crop Improvement

Ramdas Raut
(Biotechnologist)

Vijay M. Patil
(Sr. Biotechnologist)

It's a glamorous yet precious field for life sciences and agricultural researchers. It is making huge differences in the world. Guess what it could be? Yaa! I am talking about field which made great innovations in agriculture that is “**Gene Editing**” (CRISPER-Cas9) technology which has progressed a lot in the field of agriculture biotechnology.



Gene editing technique designated for CRISPR-Cas9 (Clustered Regularly Interspaced Short Palindromic Repeats), has been promoted as the big blooming era in plant science. CRISPR-Cas9 is a genome editing tool, it is faster, cheaper and more accurate than earlier techniques of editing DNA and has a wide range of potential applications in agriculture.

Researchers can precisely delete or insert genes in a plant's DNA without disturbing other portions of the genome. This technique is known for “biological equivalent to the 'search & replace' function in computer word processors.” Scientist believed gene editing approach have the potential to improve a number of crops within our current research briefcase e.g. corn, cotton, soybeans, canola, wheat and vegetable. Seed companies research is mainly focused on delivering products that solve real problems of farmers and ultimately help to feed a growing society, using new innovative biotechnology and breeding new wrinkle.

Gene editing boosts plant scientists focusing of new crops variety development e.g. blight-resistant potatoes, tastier tomatoes, drought-tolerant rice, higher-fiber wheat, improvements to yield, disease resistance, drought tolerance and many more exercise. In agricultural crops business mainly focus

on Okra, Brinjal, Cotton, Tomato, Chili and Maize etc. As far as there has been little progress in commercializing such agricultural innovations for new development and well positioned to participate in the growing global market for enhanced crop genetics.

Nirmal Seeds Pvt. Ltd. have taken initiative for generation of herbicide resistance cotton using gene editing technology in collaboration with ALGENTECH SAS, France for cotton protoporphyrinogen oxidase (PPO) gene which develop resistance against herbicide butafenacil and chlorsulfuron herbicides. Domestic and multinational seeds companies are now more careful about transgenic traits due to its delayed deregulation, be due to companies diverted on innovative productive technology which blow in cheaper and less controversial.

There are few novel successful manifestation of “Gene editing” CRISPR technology which boost agricultural crop improvement as listed below.

1. In cotton gene editing has shown useful to develop gossypol free seed in upland cotton (*G. hirsutum L.*) and for highly efficient targeted mutagenesis in cotton genome (Pengchang et.al. 2017).



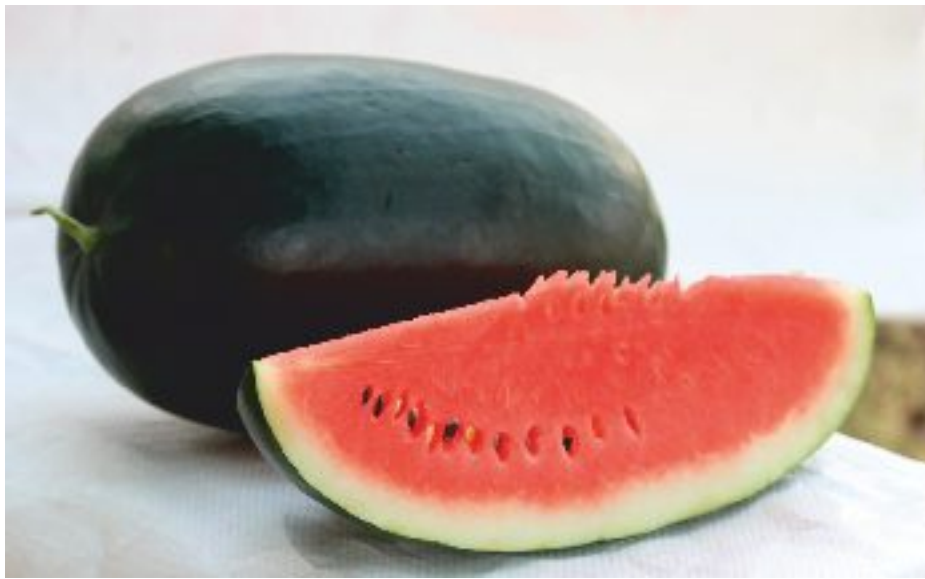
Photo Source : Cold Spring Harbor Laboratory, USA

2. In tomato crop using CRISPR/Cas9 method generate mutations in tomato (*SP5G* gene) for manipulating photoperiod response resulting rapid flowering and enhanced the compact determinate growth habit of field tomatoes, quick burst of flower production and early yield i.e more than 2 weeks faster than commercial breeder are currently producing (Sebastian Soyk, 2017).

3. In tomato crops scientist used gene editing to create perfect tomato for your salad by engineering three genes associated with highly productive tomato plants that yielded more of the desired fruit and less of the unwanted flowers and branches (Zachary Lippman, Cold Spring Harbor Laboratory, 2017).

4. Seed less tomato developed using CRISPR gene-editing technique by introducing mutation which increase level of auxin which stimulate fruits development without seeds (Keishi Osakabe, 2017).

5. Gene editing technique could be used to develop other types of fruit crop that don't require pollination, as well as introduce beneficial mutations that improve stress tolerance traits.



Mukesh B. Patil
(Plant Breeder)

B. P. Jadhav
(Sr. Scientist Vegetable)

dark red crispy flesh, less seed content, 2.5-3.5 kg fruit weight, TSS > 13° Brix and good tolerance to downy mildew, alternaria leaf blight and watermelon bud necrosis virus diseases.

Sowing method:

Land should be prepared by one ploughing followed by cultivator and Rotavator. Beds of 1 feet width should be prepared at distance of 6 to 8 feet. At the time of bed preparation 8 to 10 tones FYM and Nirmal Bio power Gold @10 kg/acre should be mixed in soil. Well prepared beds provided with drip should be covered with silver coated mulching paper. Considering the drip point, holes on mulching paper should be made at 60 cm distance. In such a way watermelon should be sown at 180 x 60 cm or 240 x 60 cm spacing. During 1st irrigation Bio Sanjivani @ 1 kg /200 lit of water should be given to crop through drip.

Watermelon Production Technology

Watermelon is one of the most important summer crops and well known for its health benefits. Presently, watermelon is getting more importance like cash crops. In earlier era, its cultivation was restricted to river bed in summer season only. Recently, it is cultivated as main crop in the field of vigilant vegetable grower. China is the leader in watermelon production and Iran, Turkey, Brazil & Egypt are among the major watermelon producing countries. In India it is cultivated on 91,000 ha. area with production of 21,69,000 tones (NHB-2017).

25-40 %. Cultivar should be selected on the basis of its suitability to growing season, soil type, climate and market demand. Recently, watermelon grower prefers Ice Box type watermelon which matures in 70 days and having 2.5 to 3.5 kg average fruit weight with black colour, oblong fruit shape, dark red flesh colour with more sweetness. Nirmal seeds has developed excellent Ice Box hybrid NWMH-945, it has wider adaptability,

Climate :

Watermelon is warm season crop grown in tropical and subtropical regions. Warm and dry weather with abundant sunshine is essential for proper growth. It is very sensitive to frost and excess humidity promotes diseases like powdery mildew, downy mildew and pest infestation. Normally 30-35° C temperature is required for excellent growth and 35-40° C is required for accumulation of more sugar in fruits.

Sowing period:

Presently, due to availability of market and innovative research hybrids, watermelon can be grown throughout the year. Considering the market requirement, farmer prefers to grow Ice box watermelon hybrids which comes to harvest within 70 days. Watermelon is being consumed during all the season & hence its requirements is more at all the time.

Varieties/Hybrids:

Selection of cultivar is most important because it can affect the total produce from

Crop nutrition and Fertiligation:

Seed rate-Ice box Hybrids- 400 to 500 g/ acre, Big sized hybrids-800 to 900 g/ acre

Days after sowing	Water soluble fertilizer Grade	Fertilizer dose/200 lit. of water (for 1 acre)
8	19 : 19 : 19	3kg
14	19 : 19 : 19	4kg
21	19 : 19 : 19	4kg
27	12 : 61 : 0	4kg
31	19 : 19 : 19	4kg
37	0 : 52 : 34	4kg
45	0 : 52 : 34	4kg
	& Boron	1kg
50	0 : 0 : 50	3kg
	& Calcium nitrate	2kg
54	0 : 52 : 34	5kg
58	0 : 0 : 50	4kg
62	0 : 0 : 50	5kg
66	0 : 0 : 50	4kg



Pest Management:

Sr. No.	Pest	Chemical	Dosage
1	Leaf miner	Bio- 303 or	1 ml/lit
		Dichlorovos or	1 ml/lit
		Chloropyriphos or	2 ml/lit
		Quinolphos	2ml/lit
2	Aphids, jassids	Imidachlopride or	1 ml/lit
		Monocrotophos or	2ml/lit
		Thiamethoxam	0.66 g lit
3	White fly	Difenthiuron or	12.5 g/15 lit
		Thiamethoxam	0.50 ml/lit
4	Thrips	Fipronil or	2 ml/lit
		Thiamethoxam	0.66 g lit
5	Leaf eating caterpillar	Dichlorovos or	1 ml/lit
		Quinolphos or	2ml/lit
		Chloropyriphos	2 ml/lit
6	Fruit fly	Use pheromone traps (cue lure)	8-10/acre
		Dichlorovos or	1 ml/lit
		Chloropyriphos or	2 ml/lit

Diseases Management:

Sr. No.	Diseases	Chemical	Dosage	Mode of application
1	Downy Mildew	Mancozeb & Metalaxyl-M or	2.5 ml/lit	Foliar application
		Fosetyl Al or	3 g/lit	Foliar application
		Mancozeb or	2 g/lit	Protective spray 5-7 day interval
		Tebusonazole	1 g/lit	Foliar application
2	Fusarium Wilt	Bio Sanjivani	5+5 g/lit	Drenching at root zone at time of sowing and 20-25 days after sowing
		Carbendazim or	2 ml/lit	Drenching at root zone at time of sowing and 20-25 days after sowing
3	Powdery Mildew	Propiconazole or	1 g/lit	Foliar application 7-10 interval
		Difeneconazole	0.5 ml/lit	Foliar application at 7-10 day interval
4	Alternaria Blight	Mancozeb & Metalaxyl-M or Carbendazim	2.5 ml/lit	Foliar application at 4-6 day interval
5	Gummy stem blight	Carbendazim or	2 ml/lit	Drenching at root zone
		Copper oxychloride	----	Paste application at infected plant part.
6	Angular leaf spot	Streptomycin sulfate	6 g/10 lit	Foliar application only at initial stage of crop growth

कपाशीवरील गुलाबी बोंडअळीचे व्यवस्थापन

डॉ. एस. ए. पाटील
(पिक पैदासकार)

गुलाबी बोंडअळी साधारण पेरणी नंतर ९० दिवसानंतर येते. पण सध्यास्थितीत गुलाबी बोंडअळीचा प्रादुर्भाव पेरणीनंतर ६० ते ७० दिवसांनीसुद्धा दिसून येते आहे. मादी पतंग अंडी प्रामुख्याने पात्या, फुलावर, कोवळ्या बोंडावर घालते. अंड्यातुन निघालेल्या अळया सुरुवातीला फुलावर जगतात त्यामुळे बोंडांची वाढ अपुर्ण होऊन ते गळतात. अळया बोंडात शिरून कापसाच्या बिया खातात त्यामुळे सरकीचेही नुकसान होते. गुलाबी बोंडअळी कोवळ्या बोंडातील पूर्ण बिया खाते तर जुन्या बोंडातील ३ ते ४ पर्यंत बिया खाते. गुलाबी बोंडअळीने प्रादुर्भावग्रस्त फुले अर्धवट उमललेल्या गुलाबाच्या कळीसारखी दिसतात. त्यांना “डोमकळी” म्हणतात. अळीची कोषावस्था ही कापसाच्या बिया आणि बोंडामध्ये पुर्ण होते. एका बोंडामध्ये १० ते १५ पर्यंत अळया असू शकतात. बोंडामधील अळीच्या उपस्थितीमुळे आणि बुरशीच्या संक्रमणामुळे रूईची प्रत बिघडते. सरकीतील तेलाचे प्रमाण कमी होते. एकंदरीत गुलाबी बोंड अळी कपाशीतील सरकी व रूईचे लक्षणीय नुकसान करते.



खादयपुरवठा करतो.

- जिनिंग मिल आणि मार्केट यार्डमध्ये कच्च्या कापसाची जास्त कालावधीसाठी साठवणुक केल्यामुळे येणाऱ्या कापसाच्या पिकासाठी गुलाबी बोंडअळीचे स्त्रोतस्थान म्हणून काम करते.
- पूर्व हंगामी (एप्रिल ते मे) लागवड केलेल्या कापसाचा फुलोरा जून ते जुलै मध्ये येणाऱ्या कमी तिव्रतेच्या गुलाबी बोंडअळीसाठी लाभदायक ठरतो.
- संकरीत वाणांच्या बोंडातील बियामध्ये वेगवेगळे असलेल्या विषाच्या प्रमाणामुळे लवकर प्रतिकार निर्माण होतो. हि परिस्थिती निवडक प्रतिकार शक्ती निर्माण करण्यासाठी अतिशय आदर्श ठरते.
- कपाशीचे पीक नोव्हेंबर नंतर किंवा काही शेतामध्ये एप्रिल ते मे पर्यंत ठेवल्यास गुलाबी बोंडअळीला वर्षभर निरंतर खाद्य पुरवठा होत राहतो.
- सुरवातीला पेरलेले पिक आणि अगोदरचे पिक यांच्या सलग उपलब्धतेमुळे गुलाबी बोंडअळीला वर्षभर निरंतर खाद्यपुरवठा होतो. त्यामुळे त्याच्या अनेक पिढ्या एक वर्षात तयार होतात. ज्यामुळे गहन निवडक दबाव तयार होवून प्रतिकार तयार होण्यास मदत होते.
- गैर बीटी कपाशीचा (रेफुजी) आश्रय पिक म्हणून वापर न करणे.
- वेळेवर आणि योग्य व्यवस्थापनाचा अभाव.
- मोनोक्रोटोफॉस व अॅसिफेट या किटकनाशकाच्या मिश्रणाचा ३ ते ४ वेळेस बरेच शेतकरी वापर करतात. या मिश्रणाचा वापर सुरुवातीला केल्यामुळे कपाशीच्या झाडावर नवीन पालवी फुटते. आणि

पिकाची वाढीची अवस्था पूर्वपदावर येवून फळधारणेची अवस्था आणि पिकाची परिप्रवतेची अवस्था उशीरा येते. या मिश्रणाचा वारंवार ३ ते ४ होणाऱ्या फवारणीमुळे पिकांची फुलोराअवस्था आणि फळधारण वेगवेगळ्या वेळेस होते.

- व्यवस्थापन
- कमी कालावधीत येणाऱ्या (१५० ते १६० दिवस) संकरीत वाणांची लागवड करावी.
- लवकर व वेळेवर पेरणी करावी जेणे करून पिकांची किडींपासुन व जमिनीतील ओलावाच्या ताणापासुन सुटका होण्यास मदत होईल. त्यामुळे पिकाला फुलोऱ्यावस्थेत व बोंडावस्थेत पुरेसा ओलावा मिळेल.
- दर आठवड्याला किडींची पाहणी करावी. त्यानंतर पर्यावरणास कमी हानीकारक पध्दतीचा वापर किड नियंत्रणासाठी करावा.
- बीटी बियाण्यासोबत १२० ग्रॅम गैर बीटी बियाणे दिलेले असते. त्याची कपाशी भोवती आश्रय पीक म्हणून पेरवे. हयाची फुलोऱ्यावस्था व बोंडावस्था बीटी संकरीत वाणासारखीच असायला हवी.
- भेंडीची सापळा पीक म्हणुन उशीरा पेरणी करावी जेणेकरून हया पिकास ऑक्टोबर ते नोव्हेंबरला फळे लागतील. गुलाबी बोंडअळी हया पिकाकडे आकर्षित होवुन कपाशी वरील गुलाबी बोंडअळी नियंत्रणात आणता येईल.
- युरियाचा जास्त वापर टाळावा. सुरुवातीच्या ४५ दिवसात नत्र आणि पालाशची मात्रा ३ वेळा देण्यात यावी. स्फुरदची मात्रा सुरुवातीलाच दयावी.
- पिकाच्या सुरुवातीच्या वाढीच्या तीन महिन्यापर्यंत किटकनाशकाचा वापर टाळावा. त्यामुळे नैसर्गिक मित्रकिडींचे संरक्षण होईल. या काळात वनस्पजन्य किटकनाशके, जैव किटकनाशके आणि मित्रकिडींचा वापर करावा.
- सुरुवातीच्या तीन महिन्यामध्ये पिकांचा कालावधी वाढविणाऱ्या किटकनाशकांचा वापर टाळावा. जसे कि मोनोक्रोटोफॉस, अॅसिफेट, इमिडाक्लोप्रिड, थायामेथोक्झाम आणि अॅसीटमिप्रिड इ. ह्या किटकनाशकांमुळे वाढीची अवस्था वाढते, फुलोरा उशीरा येतो, त्यामुळे पिकांचा कालावधी वाढतो. जर रसशोषक किडींना प्रतिकारक वाणांची लागवड केली तर पिकाला सुरुवातीला किटकनाशकाची गरज भासणार नाही.
- किटकनाशकांच्या मिश्रणाचा वापर काटेकोरपणे टाळावा : किटकनाशकांच्या मिश्रणाचा भरपूर वापर केल्यामुळे पर्यावरणाची न भरून निघणारी हानी होते. जर आपण कापसाच्या परिसंस्थेला

● प्रादुर्भाव कसा ओळखावा

उघडलेल्या बोंडावरती डाग : हे गुलाबी बोंडअळीचे प्रमुख लक्षण आहे. ही लक्षणे सुरुवातीला येणाऱ्या फुलोऱ्यावस्थेत आणि पिकाच्या वाढीच्या शेवटच्या अवस्थेत नुकसान झाल्यावर दिसून येते.

कामगंध सापळ्या मध्ये नर पतंग अडकल्यास : कामगंध सापळ्याव्दारे मादी पतंगासारखा गंध सोडल्यामुळे नर पतंग आकर्षित होतात. हे कृत्रिमरित्या बनवलेले सापळे गुलाबी बोंडअळीची पाहणी आणि प्रादुर्भाव ओळखण्यासाठी वापरतात.

डोम कळी : फुले पुर्णपणे उमलत नाहीत. ते मुरडले जातात.

हिरव्या बोंडावर दिसणारे डाग : हिरव्या बोंडावर दिसणारे डाग हे गुलाबी बोंडअळी प्रादुर्भावाचे लक्षण आहे.

हिरव्या बोंडावर दिसणारे निकास छिद्र : अंदाजे १.५ ते २ मिमी व्यासाचे लहान निकास छिद्र बोंडावर असल्यास गुलाबी बोंडअळी उपस्थित असल्याचे कळते.

● येण्याची कारणे

● जास्त कालावधीच्या संकरीत वाणांची लागवड केल्याने गुलाबी बोंडअळीला यजमान वनस्पतींचा अखंडीत खाद्य पुरवठा.

● असंख्य संकरीत वाण ज्यांचा फुलोरा आणि फळधारणेचा कालावधी वेगवेगळा असतो जो गुलाबी बोंडअळीच्या एकापाठोपाठ येणाऱ्या पिढीला अखंडीत



जास्त हानी पोहचविली नाही तर बोंडअळीचे नैसर्गिकरित्या चांगल्या प्रकारे नियंत्रण होते. पांढरी माशी आणि बोंडअळीचा पुनप्रादुर्भाव होणार नाही.

● कामगंध सापळे :- ऑगस्ट महिन्याच्या मध्यापासूनच गुलाबी बोंडअळीच्या पाहणीसाठी कामगंध सापळे ४ ते ५ सापळे प्रति हेक्टर लावावेत.

● कामगंध सापळ्यात जर कमीतकमी २४ पतंग प्रति सापळा तीन रात्रीत अडकले असल्यास किंवा १० टक्के हिरव्या बोंडाचे नुकसान आर्थिक नुकसानीच्या पातळीत झाले असेल तर उपलब्ध असल्यास ट्रायकोग्रामा बॅक्टेरी किंवा ब्रॅकॉन परजीवीचा शेतात वापर करावा.

● डिसेंबर महिन्यापूर्वी वेचणी करावी. खोडवा पीक घेणे टाळावे. पिकांचा पालापाचोळा व इतर भागाचा लवकरात लवकर नायनाट करावा.

● पिकांची फेरपालट करावी ज्यामुळे रोग, किडींची तसेच तणांच्या जीवन प्रक्रियेमध्ये अडथळा निर्माण होईल.

● सामूहिक पतंग पकडणे :- कामगंध सापळ्याचा वापर करून मोठ्या प्रमाणात सामूहिकरित्या नर पतंग पकडल्यास गुलाबी बोंडअळीचा प्रादुर्भाव कमी होईल. कामगंध सापळे शेतात, वखराभोवती, जिर्निंग

मिल्स, मार्केट यार्ड भोवती हंगामात लावल्यास गुलाबी बोंडअळीचा प्रादुर्भाव कमी होईल. ऑक्टोबर ते डिसेंबर या हंगामाच्या शेवटी सापळे लावल्यास भरपूर प्रमाणात पतंगाचे प्रमाण कमी करता येते.

● केन्द्रीय कापूस संशोधन संस्थेच्या सल्ल्यावरून खालील दिलेल्या किटकनाशकांची फवारणी करावी.

महिना	किटकनाशक	मात्रा प्रति १० लिटर पाणी
सप्टेंबर	क्विनॉलफॉस २० टक्के एएफ किंवा थायोडीकार्ब ७५ टक्के डब्लुपी	२० मिली २० ग्रॅम
ऑक्टोबर	क्लोरोपायरीफॉस २० टक्के ईसी किंवा थायोडीकार्ब ७५ टक्के डब्लुपी	२५ मिली २० ग्रॅम
ते नोव्हेंबर	फेनव्हलरेट २० टक्के ईसी किंवा	१० मिली
डिसेंबर	सायपरमेथ्रीन १० टक्के ईसी	१० मिली

गन्ने की अधिक उपज के लिए बेहतरीन...शक्तिशाली और सर्वश्रेष्ठ निर्मल बायोपॉवर गोल्ड

नया तंत्रज्ञान-नवाचार के साथ
(मायकोराईजल जैव उर्वरक)



उत्पादन एवं विक्री व्यवस्था :

निर्मल सिड्स प्रा. लि.
(ISO 9001:2015 प्रमाणित कम्पनी)

नोंदनीकृत एवं प्रशासकीय कार्यालय: पो.बॉक्स नं.63, भडगांव रोड, पाचोरा-424201,
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ई-मेल: info@nirmalseedsindia.com CIN-U01100MH1988PTC049277.



Activities of Nirmal Seeds in North Eastern Region for maximizing the yields of different crops.

Dr. D. K. Patsani
(Manager Business Development)

Since last couple of years Nirmal Seeds is working in the NE region. The North Eastern states of our country mostly known as North Eastern Region (NER) comprises eight states viz. Arunachal Pradesh, Assam, Manipur, Mizoram, Nagaland, Tripura & Sikkim. This region shares most of the international borders with Bhutan and China in North and Myanmar in east and Bangladesh in west.

NER has several unique and unparelled features like fertile land, abundant water resources, evergreen dense forests, high dependable rainfall and a mixture of socio-economic and cultural biodiversity. The temperature and climate is highly suitable for agriculture which is the main occupation of the region.

Various initiatives taken by the state Governments of NE region, day by day the awareness amongst the farming community of NE region is increasing towards high-tech and sustainable agriculture. Certainly, the Government initiatives like promotion of organic farming, mechanization in agriculture, spread of seeds of HYV of different crops as well as seeds of hybrids

and many other shall definitely led to enhancement of agricultural production of this region. Moreover, these initiatives by the state Governments of NE region has opened the doors of opportunities for the companies working in the agricultural sector. Keeping in view the facts and to contribute ourselves in enhancing the productivity of this region, the Management of NSPL far before decided to work in this region for studying the agriculture challenges of this region and to find out the solutions on these challenges.

The bottom level feedbacks from the farming community of NE region are regularly taken on their actual requirements, their problems etc. and are communicated to R & D for development of specific tailormade seed and bio organic products. As a results many of the hybrids and varieties in different crops have been developed. These newly developed seeds are tested for their suitability and adaptability through the technical expertise of the company. The company is also associated with Assam Agricultural University (AAU) Jorhat, different

KVKs and technical persons of the Department of Agriculture of various state governments. Secondly, we always aimed to transfer the hightech cultivation practices, promotion of use of organic input in the agriculture amongst the farming community of this region.

The overwhelming response and support from different government officials has encouraged us to expand ourfield activities in this area.

Nirmal Seeds has also established a bio organic inputs manufacturing unit at Guwahati for the production of ecofriendly bio organic inputs like bio fertilizers, bio pesticides, bio enriched organic manures, soil enrichers, growth enhancer etc., This unit caters the needs of organic inputs of farming community of NE region.

Nirmal Seeds has ambitious plans further to work hand in hand with the farmers to transfer the newer technologies in the field of agriculture. We are always committed towards facilititating “Go organic and Grow organic” through continuous R & D for the region.





Amazing benefits of sweet corn for human health : A Powerhouse of antioxidants

B. P. Jadhav
(Sr.Scientist Vegetable)

By considering the important nutritional crop, Nirmal Seeds Pvt. Ltd. developed a sweet corn hybrid NSCH-130 which has very high yield potential with high degree of tolerance to major diseases. The hybrid NSCH-130 has very high TSS with excellent threshability.

Sweet corn (*Zea mays convar. Saccharata var. rugosar*) also called Sugar corn and pole corn is a variety of maize with high sugar content and prepared as a vegetable. Sweet corn is the result of naturally occurring recessive mutation in the genes which control conversion of sugar to starch inside the endosperm of the corn kernel. By considering the important nutritional crop, Nirmal Seeds Pvt. Ltd. developed a sweet corn hybrid NSCH-130 which has very high yield potential with high degree of tolerance to major diseases. The hybrid NSCH-130 has very high TSS with excellent threshability.

In the most part of the world, a day is't complete without munching an a crunchy snacks, how ever, most snacks are high calories and fat- almost devoid of "real nutrition on snacks that's favorite of crunchy snacks lovers is corn. Are corn kernels are healthy? What are the benefits of sweet corn?

Corn is packed with high nutrients which are useful for a human body in many ways.

It ensures idyllic functioning of several internal systems such as cell generation and prevents constipation and various other digestive problems. It is a boon for diabetic people. This nutrient packed starchy snack is low in total fat and has no saturated fats sodium or cholesterol, It is high in vitamin 'C' and good source of fiber.

Healths benefits of Sweet Corn

- 1) Being a power house of antioxidants it prevents aging process and maintain skin
- 2) Sweet corn oil contains essential minerals and vitamins. Skin massage with corn oil enhances skin texture.
- 3) There are many references that sweet corn paste is useful for removal of facial acne scars owing to its high vitamin "E" content.
- 4) The vitamin "C" content and other antioxidants in sweet corn helps in strengthening the hair strand & prevents hair drop also.
- 5) Regular consumption of sweet corn absorb bad cholesterol (LDL cholesterol). Sweet corn also contains carotene and bioflavonoids which controls cholesterol levels in the blood.
- 6) Beta carotene which is a precursor of vitamin "A" present in sweet corn promotes better vision.
- 7) Sweet corn also contains vitamin B. It is reported that the vitamin "B" regulates protein, lipid and carbohydrates metabolism and the phy-tochemical present regulate the release of insulin preventing diabetes.
- 8) Lot of dietary fibers present in sweet corn helps to prevent constipation and enhances digestion.



Effect of high temperature on germination and seedling vigour of Pea (*Pisum sativum*).

M. T. Sable
(Manager QA)

food in their endosperm, or inner tissues, and in their cotyledons, or first leaves. As they absorb water, this food is released and converted into energy needed by the developing embryo. Pea seeds deprived of water shrivel and die, while those that receive too much water become water-logged and start to decay.

Planting Depth:

A seed's proper planting depth corresponds to its size, as the larger the seed, the more food and energy it contains to help it get a strong head start. Pea seeds germinate best when planted about 2-3 cm deep in loose soil rich in organic matter such as aged compost or manure. Planting the seeds too deeply forces them to strain during germination, sometimes producing long straggly weak vines; planting them too shallowly doesn't provide enough of a base to keep the plants firmly anchored to the soil.

Thus in Indian condition Nirmal's Pea variety NP-20 are grown in varied weather conditions. It requires cold and dry climate. The longer cold spell helps in increasing yield. This Pea variety can germinate even at a minimum temperature of 5° C but the process is slow. The optimum temperature for germination is about 20° C. At Optimum temperature, germination is rapid.

Garden pea (*Pisum sativum* L.) is one of most important cool season vegetable crops grown throughout the world. Ethiopia is probably the main centre of origin of the garden pea. It is very palatable and nutritious for human consumption and is taken fresh, canned, frozen or in dehydrated form. It contains higher proportion of digestible proteins along with carbohydrate, phosphorus, iron, calcium, vitamins A and B (Watt and Merrill 1963 and Hassan 1997).

Various factors directly influence seed physiological potential, including storage conditions, which are fundamental for maintaining viability and vigor. This is significantly affected by initial seed physiological quality, seed water content, relative humidity, temperature, action of microorganisms, insects and storage period (Carvalho and Nakagawa 2000). It is well known that seed deterioration is faster and intense in tropical and subtropical regions due to the unfavourable weather conditions (Baudet 2003).

Nirmal Seeds Garden Pea Variety NP-20 is a cool season variety and is mainly grown in Uttar Pradesh, Bihar, Haryana, Himachal

Pradesh, Madhya Pradesh, Panjab & western part of Maharashtra. Any Garden Peas variety germinate best under certain soil conditions and temperatures.

Soil Temperatures:

The ideal soil temperature for pea germination is 18° C -20° C with an outdoor temperature of 18° C- 25° C. Peas germinate more slowly when planted in cooler soil temperatures. Peas sown in soils with a temperature of 16° C -18° C takes about nine days to germinate, while peas take about 36 days to germinate in soil with a temperature of 4° C -5° C or 35° C- 40° C.

Temperature:

Peas are considered a cool-weather crop, as they germinate best at temperatures that range from 10° C to 20° C. Colder temperatures delay germination and may foster seed decay, planted into too warm weather condition, the seeds germinate poorly when day time temperatures exceed 30° C.

Moisture in the Soil:

In addition to heat, peas need moisture to germinate. While dormant, pea seeds store



Product performance of Hy. Chilli NCH-1544 (Nirmal Deluxe) in AP



Farmer meeting & Dealer visit at Kampadu village of Karnool Dist.

Mid-tall, semi spreading plants with concentrated fruit bearing ability, highly tolerant to anthracnose and phytophthora blight diseases. It is suitable for dry chilli purpose due to good color retention.



Use of Bio Power Gold on Onion

Product performance of Hy. Mustard NIMH-23 in UP



Farmer Name : Aadesh Pratapsing chauhan
Village : Semrai, Dist: Mainpuri



Farmer Name : Dharma Parma Rathod
Village : Walthan Tal : Chalisgaon

Use of Bio Power Gold on Sugarcane



Seed Production plot of Maize in AP



Farmer Name : Niwruuti Baban More
Village : Walthan Tal : Chalisgaon



Product performance of Hy. Tomato NTH-3622 in Mirzapur and Kanpur dist. (UP)



Product performance of Hy. Brinjal NBH-1113 in AP



Farmer Name : G. Ramu Garu
Village : Edupugallu, Mandal-Penamalur, Dist: Krishna

Product performance of Hy. Bajra NPH-4915



Farmer Name: Rajkumar S/O Mohar Singh
Village : Shehor, Dist. Mohindergarh

Product performance of Hy. Paddy NPH-150



Farmer Name : Parladh Singh S/o Silpi Singh
Village : Bhatt Majra teh Pehowa

Product performance of Pea NP-20



Farmer Name : Jeevanand Thakur
Village : Jarol The Thung Distt. Mandi

Use of Bio Power Gold on French Bean Crop



Farmer Name : Amninder Singh
Village : Gillan Distt Amritsar



Bio Power Gold Launching Programme at Panjab, Haryana & Maharashtra



Hon. CMD R.O.Patil addressing Dealers & distributors during launching programme





Bio Power Gold Launching at Kolhapur (Maharashtra)



Bio Power Gold Launching at Solapur (Maharashtra)



Farmer meeting at Satwe, Tal: Panhala Dist : Kolhapur





New plant machinery setup at Bio input division



◆ Promotional activities

Promotional activities for Bio Power (Gold) a Mycorrhizal bio fertilizer



◆ Exhibitions



◆ Cultural activities :



Lord Ganesha poojan during Ganesh festival



◆ CMD & Director's Visits





◆ Eminent Guests



Director of Al Zahraa Land Egypt visited Nirmal's R & D



Visit of Director Dr. Alok Adholeya, Sr. Director Sustainable Agriculture Division, TERI, New Delhi & Dr. Michel Aragno, Honorary professor of Microbiology, University of Neuchâtel (Switzerland)

◆ Conference & Seminars :



Hon. Director R & D Dr. J.C.Rajput delivered a lecture during brain storming seminar of hightech vegetable cultivation



◆ Baramati Expo-Field Demonstration



Hon. Director D. R. Deshmukh sir observing results of Bio Power (Gold) on wheat



Farmers interacting with Scientists of NSPL during Expo



Effect of Bio Power Gold on Wheat



Effect of Bio Power Gold on Sugercane



Field Demonstration results of Bio Power (Gold)

◆ **New Joinings**



Mr. Yadunath B. Paratkar
Sr. Manager
Processing



Mr. S. Sathiyasselan
Regional Manager
Mktg (Tamilnadu)



Mr. Shiv Shankar Shukla
Regional Manager
Mktg (Haryana)



Mr. Ramnikbhai K. Dobariya
Dy. Regional Manager
Mktg (Gujrat)



Mr. Bishnu C. Samantaray
Dy. Regional Manager
Mktg (Odisha)



Mr. Bhushan S. Bhadane
Bio-Technologist
(Pachora)

◆ **Twinkling Stars**



Harshal M. Alone
2nd Pession in "Lift" off Competition

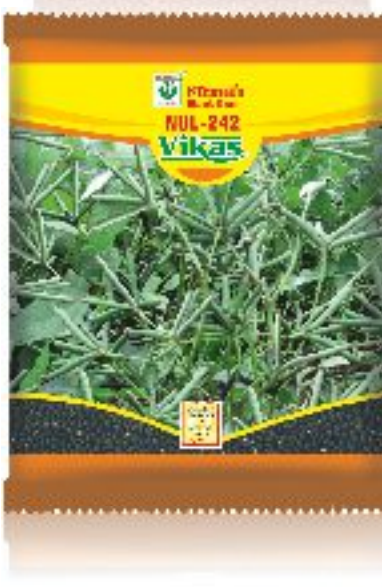
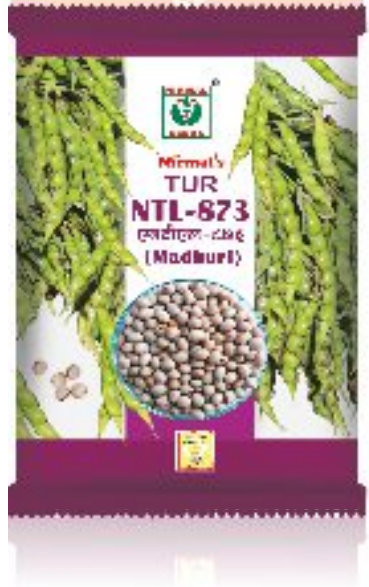
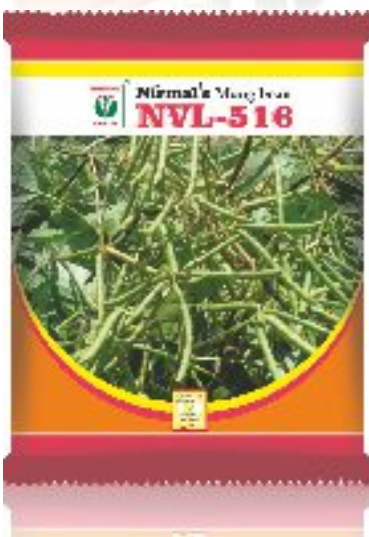


Shahnaaz Fathimas
86% in State board of school exam.



Kaveri Namdev Rajput
Gold Medal in 3rd State level
Karate championships

◆ New Packing /New Product Launches



◆ News & View



शेतकऱ्यांच्या भल्यासाठी बीटी कॉटन कंपन्यांची मक्तेदारी संपवा

निरुल कुलपिस्तुन्नु निरुल सीड्स मिश्रण विज्ञानालय



निरुल कुलपिस्तुन्नु निरुल सीड्स मिश्रण



बीटी तंत्रज्ञानास सक्षम पर्याय उपलब्धतेसाठी सेनेचे साकडे



निरुल कुलपिस्तुन्नु निरुल सीड्स मिश्रण
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NSPL's Head Office



NSPL's Research and Development Center





On the occasion of Independence Day 15th August 2017, Hon. CMD hoisted the flag.

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