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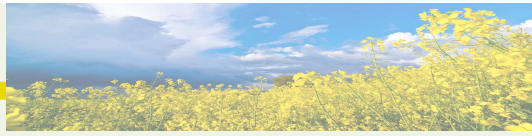
INTENSIVE AGRICULTURE

October-December, 2021



सत्यमेव जयते

GOVERNMENT OF INDIA
MINISTRY OF AGRICULTURE & FARMERS WELFARE
DEPARTMENT OF AGRICULTURE & FARMERS WELFARE
DIRECTORATE OF EXTENSION



A INTENSIVE GRICULTURE

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EDITORIAL

The Ministry of Agriculture & Farmers Welfare, Govt. of India is working towards welfare of farmers by implementing various schemes and initiatives. The policies and decision taken by the Government in recent years have improved the livelihood of farmers and enhanced production of agriculture commodities. Record production of agricultural as well as horticultural commodities have been achieved in previous year. A significant increase in trade and export of agricultural commodities was also noticed. The paramount importance given to the agriculture sector by the government and formulation of farmer friendly policies have collectively resulted in the overall growth of agriculture sector.

The schemes like PM-Kisan Samman Nidhi, PM-Kisan Mann Dhan Yojana have tremendously supported the farmers and raised their self-confidence. The assistance provided under the PM-Kisan scheme has helped the farmers for purchasing crucial agri-inputs and liberated them from the clutches of money lenders.

Conservation of soil health is another important initiative of the government which is also the need of hour. The Soil Health Card scheme and Parampragat Krishi Vikas Yojana have made remarkable progress and achieved milestones in their journey of soil health conservation. The schemes like PMKBY, e-NAM, PMKSY, KCC, SMAM etc. have benefitted the farmers in various steps of agriculture and enhanced the ease of farming.

The post harvest loss of agricultural produce is a limiting factor and challenge in enhancing the farmers' income. To address this challenge, the government has recently announced an Agriculture Infrastructure Fund of Rs.1 lakh crore for funding Agriculture Infrastructure projects at farm gate and aggregation points for affordable and financially viable Post Harvest Management infrastructure.

In the recent years, government has major focus in agriculture sector and the MoA&FW is working continuously with holistic approach after addressing the fundamental problems of farmers. The impact of farmer centric initiatives, schemes and policies of government is reflected in the livelihood of farmers and overall growth of agriculture sector.

Dr Sanjay Kumar Joshi

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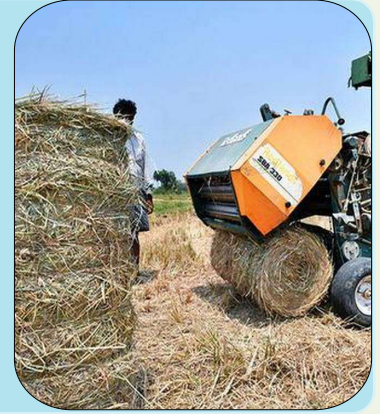
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Paddy Residue Management

Ankit Sharma and Amandeep Singh Brar



Rice wheat is the pre-dominant cropping system in Moga district of Punjab state. It is estimated that total cultivated area in district Moga is 1,95,237 ha under which Paddy/Basmati cultivation area is 1,76,000 ha (91.27%) and 1,75,000 ha (89.63%) area is under wheat crop cultivation. About 90 % area of paddy cultivation is harvested by the combine harvester which leaves behind the huge amount of paddy residue in the field. It is observed that from one acre of harvested paddy field approximately 25-35 quintal paddy straw can be obtained. Majority paddy straw is burnt by the farmers. The on field impact of burning includes removal of a large portion of the organic material, denying the soil an opportunity to enhance its organic matter and incorporate important nutrients such as nitrogen and phosphorus, as well as, loss of useful micro flora and fauna. The off-field impacts are related to human health due to general air quality degradation resulting in aggravation of respiratory, eye and skin diseases. Fine particles also can aggravate chronic heart and lung diseases and have been linked to premature deaths in people already suffering from these diseases. The black soot generated during burning also results in poor visibility which could lead to increased road side incidences of accident. It is thus essential to mitigate impacts due to the burning of agricultural waste in the open fields and its

consequent effects on soil, ambient air and living organisms.

In view of the serious problems associated with the burning of paddy residues, sincere efforts are needed to find ways and means to efficiently utilize the huge amount of surplus rice residues produced for maintaining soil, human and animal health, and increasing farmer's profits.

Possible solution to paddy residue management:

· Use of paddy straw management machinery

The following machineries/technologies are helpful in management of paddy straw in various ways:

1. Collection of paddy residue (Machine used - Straw baler): This machine collects the paddy straw from the field and makes bales of paddy straw in the compact form which can be transported to the industry or power plant for end use. Before bailing, first stubble shaver is operated to harvest the stubbles from base level and then lining operation is performed by the rake machine. It can form bales of varying length from 40-110 cm. The height and width of bales is generally fixed at 46 cm. The weight of bales varies from 15 to 45 kg depending on moisture content

Krishi Vigyan Kendra, Moga, Punjab



Key reason for straw burning: Following are some of the key reason for paddy straw burning:

S. No.	Reason	Remarks
1	Mechanical harvesting	The combine harvester cuts the crop well above the ground, leaving behind substantial amount of paddy stubble. The machine leaves the stubble in such a state that it is difficult to collect them manually. Physical removal of this crop residue is not feasible because of increased labour cost.
2	Low off field use	Stubble left on the land is of no use as it has less economic and nutritional value. Paddy straw has high silica content and thus it is non-palatable to animals. Due to little off field use of stubble as animal feed and other general uses, farmers are prompted to burn it on the field instead of incurring a high cost on collecting it.
3	Time gap	The time gap between kharif harvesting and rabi planting is between two to three weeks. During this time, farmers clear the fields by burning the paddy residue and ready them for the sowing of winter wheat crop as delay in sowing affect the yield of wheat crop.
4	Long duration varieties	Farmers used to cultivate the long duration varieties of paddy (e.g. peeli pusa and dogar pusa) crop due to which very less time is available for the field preparation to sow the next crop. This short period availability makes the farmers minds towards burning of crop residue.
5	Heavy straw load	The long duration varieties (Pusa 44, Peeli Pusa and Dogar Pusa) leave much residue load (35-45 q/acre) after the harvesting as compared to the paddy varieties recommended by Punjab Agricultural University. This heavy straw load can only be handled by the farmers by fully burning (100 % straw burning) as farmers find straw burning an easy and fast method to manage the heavy straw load.
6	High initial cost of machinery	High initial and running cost of paddy straw management machinery like happy seeder, chopper, baler etc encourages the farmers to burn the paddy straw.



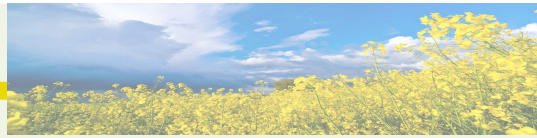
Rake and baler machine in operation



Bales formed and transportation for end use

of straw and length of bales. The capacity of baler varied from 0.70 – 0.72 ha/h after raking paddy straw.

2. Mulching of paddy straw (Machine used - Happy seeder): This machine sow the wheat crop directly in the combine harvested field without removing paddy straw. This PTO driven machine can be operated with 45 hp tractor or above and can cover 0.30-0.38 ha/h. It consists of two separate units i.e. one straw management unit and other sowing unit. The happy seeder cuts, lifts and places the standing stubble & loose straw, which acts as mulch and sows the field in a single pass of



the machine. Uniform distribution of loose straw is pre-requisite for smooth operation of the happy seeder. For this purpose **Super SMS** (straw management system) attachment is used at the back of combine harvester. It is an attachment installed at the back of combine harvester which chops and evenly distributes the paddy straw coming out from the combine harvester.

3. Incorporation of paddy straw in soil (Machine used: Paddy straw chopper): This machine chops the paddy straw in small pieces and spreads in the field which can further be incorporated in the field with ploughing. It is a tractor PTO driven machine and can be operated by a 45 hp or above tractor. It can cover 0.33-0.38 ha/h. The chopped and spread stubbles are then incorporated in the wet soil conditions (irrigated field) with the help of rotavator or disc harrow and decompose with time. Thus, the wheat sowing is done after 2-3 weeks, depending on the soil type, with the help



Paddy straw mulcher/chopper in operation

of no zero till drill. For dry mixing of chopped stubbles, mould board plough can be used. This is an environment friendly technology as farmers do not need to burn the paddy straw left in the field and also improves the soil health.

• **Use of Short duration paddy varieties:** Cultivation of short duration, Punjab Agricultural University, paddy varieties (PR 121, PR 122, PR 124, PR 126, PR 115)

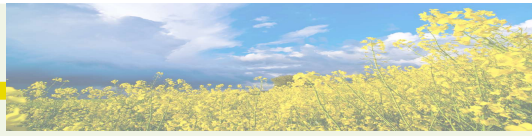
takes 20 to 40 days less than un-recommended paddy varieties such as peeli pusa and dogar pusa. Use of such short duration paddy varieties generate the ample time for the field preparation to sow the next crop without straw burning.

• **Banning crop residue burning:** Crop residue burning was notified as an offence under the Air Act of 1981, the Code of Criminal Procedure, 1973 and various appropriate Acts. In addition, a penalty is being imposed on any offending farmer. Village and block-level administrative officials should be used for enforcement.

• **Crop diversification:** There are various ongoing, long-term efforts at diversification of cropping techniques, such that crop residue burning can be effectively prevented. This is being attempted through cultivation of alternate crops (apart from rice/paddy and wheat such as moong, potato, vegetables etc.) that produce less crop residue and have greater gap periods between cropping cycles.

• **Establishment of a marketplace for crop residue:** Efforts should be made to increase the avenues for the alternate usage of paddy straw and other crop residue. For instance, paddy straw has a considerable calorific value,

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Converting Covid-19 crisis into an Opportunity for Self Employment

*Dr.G.Prasad Babu¹, M.Jayalakshmi², B.H.Chaitanya²,
Dr.A.Lavanya², K.Raghavendra Chowdary², & P.Aparna²*



Announcement of lockdown due to COVID-19 pandemic in the country led to paralysis of transport, movement of agriculture produce and trading. Labour shortage resulted into leftover of perishable agriculture produce like fruits & vegetables with the farmers incurring huge losses. In order to create marketing facility to the farmers produce on one hand and creating self employment opportunity to the rural unemployed youth of adopted villages on another hand KVK Banavasi identified interested 10 rural educated unemployed youth and trained them for the purpose of marketing of these produce through **market on wheels** concept. These trained youth were linked with producers of fruits, vegetables



and other agriculture and allied products and encouraged to buy them at reasonable price and sell in different villages and small towns. Due to this intervention within one month they sold 9.5 tons of sugarcane, 7.2 tons of fruits (Mango, Banana, sapota, sweet orange, water melon, musk melon & fig), 2.1 tons of vegetables, 36,000 eggs and 126 broiler birds with a net profit of Rs.1,48,540 and around Rs.15,000/- net profit to each individual.

Details of produce sold and earnings:

This intervention of the KVK, Banavasi gave confidence to the rural youth to convert this crisis into an op-

Sn	Name of the item	Quantity sold (Kg.)	Net profit (Rs.)
1	Sugarcane	9,000	67,500
2	Fruits	7,000	28,000
3	Vegetables	2,100	21,000
4	Eggs	36,000 No.	27,000
5	Broiler birds	126 No.	5,040
	Total	18,100	1,48,540

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portunity and they have continued this marketing concept. By seeing this success 15 more youth in different villages have also shown interest and joined with them for getting self employment. This inter-

vention has also reduced the marketing burden of the farmers who were unable to sell their products due to lockdown and earned reasonable returns and expressed their satisfaction.

Continued from page 5:

making it suitable for use as a fuel in biomass-based power plants. Similarly, it can be utilized for the preparation of bio-fuels, organic fertilizers and in paper and cardboard making industries. The strategy, broadly, is to assign a real economic and commercial value to the agricultural residue and making burning it an economic loss to the farmer.

Summary

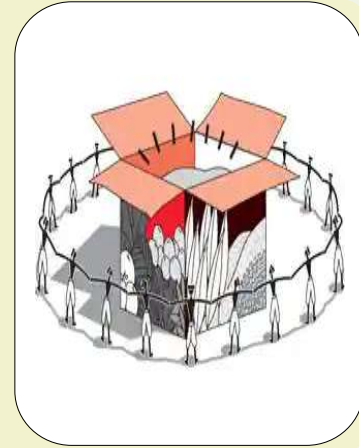
In order to minimize the problem associated with paddy straw burning, effective ways discussed can play a vital role. The area under these machines

and technologies is increasing day by day. But due to high capital cost of machinery, their availability to the small farmers should be encouraged through contractual services providers and cooperative societies. The government provides the subsidy on these machines for their promotion and to avoid the reluctance of farmers in using these machineries. These machines and technologies have adequate potential for paddy straw management as these are helpful in avoiding paddy straw burning; provide additional income to the farmers; maintaining soil health and reduce human/animal health hazards.



Rishiwat Farmers Producer Company: Empowering Small and Marginal Farmers

Dr. Ravindra L. Kale¹ and S. K. Deshmukh²



KVK, Karda (Washim) is a frontline extension model at district level established in 1994-95 which is designed and nurtured by ICAR, New Delhi. KVK aims at assessment of location specific technology models in agriculture and allied enterprises through need based trainings on-farm trials and demonstrations. For implementation of its mandatory activities and sponsored programme KVK mainly works in cluster approach in its adopted villages through formation of Technology Transfer Clubs (TTCs) funded by NABARD.

In 2011-12, for next three year period NABARD had sanctioned Pilot project-Augmenting Productivity of Lead Crops/Activities through adoption of sustainable agricultural practices in five adopted villages covering 2000 farm families and an area of 6071 ha. One of the important activity of this project was all the beneficiary farmers should be part of formation of farmers groups.

Immediately after successful completion of Lead Crop Project, in the year 2015, NABARD sanctioned another project on Promotion of Farmers Producers Company's (FPCs) for three year period to KVK. The Lead crop project has shown encouraging results and more than 750 farmers have been mobilized into vil-



lage-level Farmers Interest Groups (FIGs) which have been federated and accommodated as a shareholder in Rishiwat Farmers Producers Company Ltd. in 2016. Seed Production, processing and Marketing are major core activity of RFPCL in the selected cluster under this NABARD project.

Initially as per deliverables on specified timeline KVK conducted awareness program and farmers mobilization activity of the identified cluster Followed by registration, business plan preparation and capacity buildings of all stakeholders.

Convergence activity :

Soon after completion of eligible activities establishment of Seed processing plant of 4 TPH capacity was sanctioned by Agricultural Depart-

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Table-1 Seed Production Activity of Rishiwat FPO

Crops	Year / Qtl.				No. of farmers	Villages Covered
	2017-18	2018-19	2019-20	2020-21		
Soybean	550	470	1500	2500	850	75
Black gram	00	00	40.00	50.00	15	05
Green gram	00	00	25.00	30.00	10	05
Pigeon pea	00	00	71.00	100	25	10
Chickpea	300	430	943	1200	525	45
Wheat	00	00	00	3000	215	35
Total	850	900	2579	6880	1640	175

ment under NFSM and Turmeric Processing unit under ATMA-MACP Project. To store the seed FPC has constructed warehouse of 10000 metric tones capacity under POCRA Project.

Rationale behind RFPCL :

- Washim district is among “ Aspirational district” in Maharashtra. identified by NITI Aayog.
- District is predominantly agricultural, out of total rural population of 9.85 lakhs around 3.85 lakhs are having agriculture as the main activity.
- Out of total land holding 22 % accounted by Marginal and 37 % by Small farmers.
- Small and Marginal farmers do not have economic strength to adopt production technologies services and marketing including value addition.
- Therefore, formation of FPC by farmers led to better collective strength for better access to quality input technology credit and better marketing access.
- FPC also enhances bargaining power and farm related value accruals.



Rishiwat FPC

Major challenges / problems faced by the farmers:-

- Non availability of quality seed of improved varieties has been major constraints in the district.
- Almost rainfed crop therefore influenced by vagaries of monsoon.
- Lack of technical knows how.
- Lack of adoption of improved technology.
- Lack of timely availability of appropriate quantity and quality of agriculture inputs.
- Lack of access to extension services as well as markets
- Farmers have limited capability to autono-

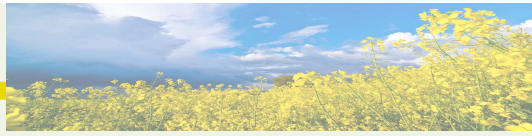


Table-2 Business turnover and profit earned by RFPCL

Sr.No	Year	Turn Over (lakhs)	Profit earned (Rs)
1	2016-17	21.00/-	-1700/- (loss)
2	2017-18	39.00/-	+436400/-(Profit) and ITR paid is 124500/-
3	2018-19	79.53/-	1552634/- (Profit) and ITR paid 252390/-
4	2019-20	126.00 /-	61.50 lakhs (Profit)

Working Capital and Business activity -

Table-3 Statement showing income of FPO members

Farmers base of FPO	Share Holders of RFPCL	RFPCL Annual Turnover (Rs/Yr.)	Increased average additional annual income per acre of certified seed grower from seed production	
			Before FPO membership	After FPO membership
1825	1191	75 Lakhs*	2700/-	4800/-

• Includes income of turmeric processing, soil testing and sale of critical inputs.

mously invest in processing, storage and custom hiring facilities.

Efforts of RFPCL -

To overcome the above problems Rishiwat Farmers Producers Company Ltd are undertaking seed production of major crops and equipping their share holder to become certified seed producer. Growing certified improved seed is a profitable business enterprise for RFPCL.

To improve availability of working capital and development of business activities Bank of Baroda,



Seed Processing Plant



Bagging and Sealing of seed bags

1. Small and Marginal farmers have no option other than to come together to Rishiwat FPO which has- provided opportunities of seed production.
2. Apart from business activity Rishiwat FPO has
- trained more than three thousand farmers on good agricultural practices for last four years.
3. Share holder seed producer can produce enough seed for their own consumption and sell the seed to other farmers to meet their expenses.
4. Seed production has helped growers to have access to new varieties.
5. Growing certified seed is profitable enterprise

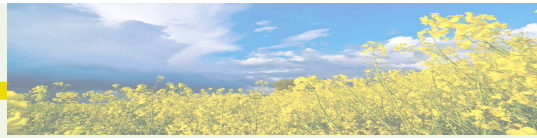
(BOB) branch Washim has sanctioned Rs. 1.0 Cr as a Cash Credit limit to RFPCL.

Profit sharing: 50% of the profit goes to farmers while 10% was utilized for operational coat of FPO and 40% for quality improvement and infrastructure development of FPO.

Advantages of Rishiwat FPO initiatives:

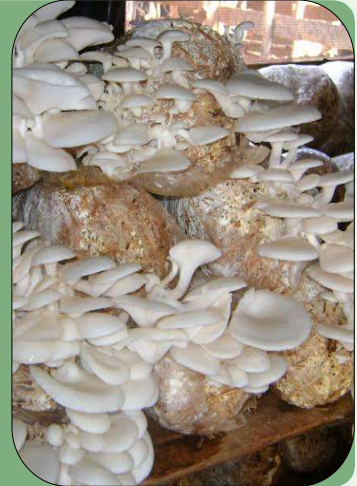
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Intensive Agriculture



Scope Of Mushroom Cultivation in Dry Land Condition of Bundelkhand

Aditya Kumar Singh



Mushroom is one of the most important microbes used as sources of human food. They are rich sources of nutrition. More than 2000 species of microbes are edible, only about 2 dozen edible mushrooms have been commercially exploited around the world. Only 3 types of mushrooms cultivated in India.

Types of mushroom

S.No.	Types of mushroom	Species
1	White button mushroom	<i>Agaricusbisporus</i>
2	Oyster mushroom	<i>Pleurotus spp.</i>
3	Paddy straw mushroom	<i>vovarielleaspp</i>

These varieties are being cultivated commercially. Button mushroom comprises more than 90% of total mushroom production in India. All the 3 cultivated mushrooms are not only differing in their shape, size, colour and biochemical composition but they show variation in their requirement for growth medium substrate, temperature and other physical factors. Obviously, they also require different infrastructural facilities for growing, post-harvest management and marketing.



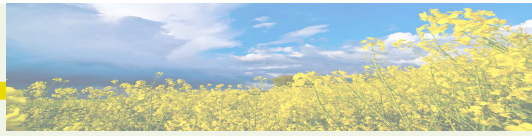
Scope of mushroom cultivation in Bundelkhand

Bundelkhand region is situated in central plateau and hill zone of Uttar Pradesh and Madhya Pradesh. 13 districts come under this region, where 7 districts are of Uttar Pradesh and 6 districts are of Madhya Pradesh. The climate of this district is very warm with low & irregular rain fall, undulating lands and sub-humid climate with maximum temperature ranging from 25°C to 48°C and minimum temperature ranging from 3°C to 35°C. The average annual rainfall is about 850.0 mm with 51 average rainy days.

Oyster mushroom

The *Pleurotus spp.* Derive their common name due to the oyster like shape of their fruit body. A

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number of species of oyster mushroom are under cultivation in India which are:

P. sajorcaju, *P. flabellatus*, *P. ostreatus*, *P. florida*, *P. citrinopileatus* and *P. platypus*.

Pleurotus spp. is most popular and well-adapted species in all over India, mostly in Madhya Pradesh. *Pleurotus spp.* can be grown directly on unfermented substrate derived from a wide variety of crop residues. it can utilize any organic waste rich in lingo cellulosic. Some of the materials used for its cultivation are cereals and millets straws 'residues' of oilseed and pulses, cotton jute and coconut waste sugar-cane, tea leaf waste paper etc. Similarly, species of oyster mushroom show good adaptability of a wide range of temperature, making it possible to grow this mushroom almost round the year with less resources in controlled climate conditions. It has good rehydration capacity hence easy in preservation and marketing. With all these qualities, this mushroom is highly suitable for Bundelkhand farmers.

Cultivation of *Pleurotus spp.*

Crop residue like cereal straw free from mouldy growth is first chopped in to smaller 1-2" bits and soaked in cold water (18hr), or hot water (half-an-hour), or aqueous solution of Bavistin (75ppm) and formalin (500ppm) for 18hr. the straw is then spread on a wire-mesh or bamboo mat forexc

cess water/solution to drain off and then filled spawned in the growing container, which may be a polythene bag, wooden box/tray, a nylon-bag or on a polythene sheet to warp the straw block made with the help of a wooden mould. The beds so prepared are kept in a warm place safe from rats for about 2-3 weeks for spawn- run. At the end of the incubation, the straw is fully impregnated and covered with white mushroom mycelium and the beds become quite compact, so that they maintain their shape even after they are taken out of poly bag, or polythene covering etc, and kept on a shelf made of bamboo or wooden beadings or iron in a well-ventilated growing rooms. If maintained in a humid and well ventilated condition and free from insect and moulds, the beds come to fruiting within a week or so . The pin - heads grow in to oyster –shaped fruit-bodies, which are harvested before they mature and shed spores. Within a week, the same bed fruits again to give the second flush. 3-4 flushes are harvested to obtain 70-80% conversion ,which proves highly profitable in view of the low-cost of cultivation and very fast return of the investment.

Harvesting and post-harvest management

Mushroom pin head start appearing after another 7-10 days, they are harvested accordingly. About two-third of the total crop can be harvested within first 3 week. The beds are retained for up to 6 weeks of fruiting, the growing rooms are then emptied and cooked out to kill pest/pathogen if any attacking the crop to protect the subsequent crop-cycle.

Generally mushrooms are harvested as oyster which if allowed to grow further reveal pink gills due to ruptured veil which are known as cup. They further grow in size and become fully open flat exposing dark gills. If the harvesting is delayed further , it deteriorates and dies soon .



Mushrooms have a very short shelf-life. They should be sold immediately after harvesting. They are stored without washing in paper envelop kept in plastic bags to –prevent moisture loss and are stored in refrigerator (lower shelves) for less than week.

Precautions for Mushroom Cultivation:

1. Maintain cleanliness in and around the farm .any leftover or refuses must be buried in soil
2. Prepare substrate only on a cemented platform cleaned with 2% formalin solution
3. Use pasteurized compost and casing should be preferred.
4. Use healthy spawn, free from contaminants; Reject spawn showing even a little infection
5. Clean area, trays, old bags before spawning
6. Growing rooms must be cooked-out with live-steam for 12hr at temperature above 70 degree Celsius before/after a crop, alternatively, spray thoroughly 2% formalin solution on flour,walls racks etc and keep the room closed for 24hr before use
7. Use a foot dip (with germicidal solution) before entering the growing area/rooms
8. Personal hygiene of workers should be monitored and use clean and disinfected tools /implements during spawning /casing and harvesting
9. Reject any infected bag/mushroom and treat them with formalin or before they are buried in the soil
10. Growing rooms should be provided with

insect –proof nets in doors and windows or any other inlets

11. Use safe and recommended dose of pesticides only when absolutely necessary and between the flushes.

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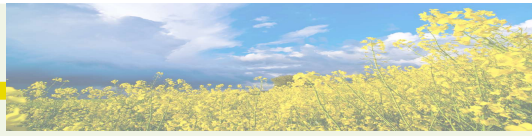
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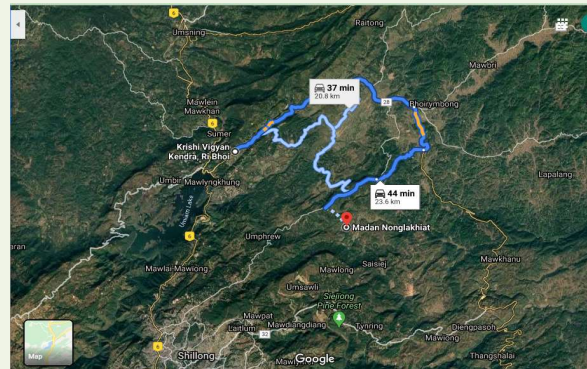


Doubling Farmers Income In Madan Nonglakhiat Of Ri-bhoi District, Meghalaya

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Madan Nonglakhiat is a medium size village located in the newly constituted Bhoirybong block (earlier Umsning block) of Ri Bhoi district, Meghalaya. The village is situated at a distance of 23.6 Km from KVK Ri-Bhoi and 47 Km from district head quarter Nongpoh at Latitude 91°59.993'N, Longitude 25°42.262'E with an elevation of 891 m above MSL. The undulating terrain of the village falls under subtropical hill zone with dark reddish brown and loamy silt with the major farming systems followed in the village are Agriculture + Horticulture + Fishery and Agriculture + Horticulture + Animal Husbandry. A total of 138 farm families with a population of 663 (344 males and 319 females) are inhabited in the village covering 99.4% ST population. Total farm area available in the village is approximately 89 ha area, out of which 63 ha are under cultivation with remaining 26 ha as forest area. The average land holding of the village is 0.65 ha. The village has 283 local breed of cattles, 42 indigenous goat and 93 pigs, backyard poultry with 8-10 numbers of birds per house hold. There are five Shelf Help Groups (SHGs) functioning in the village. As per constitution of India and Panchyati Raaj Act, Madan Nonglakhiat village is administrated by



Sarpanch (Head of Village) who is elected representative of village. Agricultural and allied activities are the main source of income among the villagers. The average monthly income of the village is Rs. 6136 as per baseline survey report.

The village was surveyed in the year 2017 with the officials of line departments and SWOT analysis was carried out with Strengths of demographically more number of young people, Weaknesses: lack of infrastructure, financial condition, lack of competence, Opportunities: mode of participation among the rural youth is higher in comparison to other villages, proximity to state capital, KVK and other line departments, Threats: out migration of youth to urban areas for job seeking and better livelihood. Hence, the village was adopted as a

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pilot project for Doubling Farmers Income (DFI) by KVK Ri-Bhoi during October 2017 through technological backstopping, intensive capacity building for skill and knowledge development and market linkages.

KVK Interventions

KVK Ri-Bhoi has undertaken the following activities in the DFI village Nonglakhiat during last three years (2017-20) based on the need analysis through PRA and base line survey for enhancement of income and livelihood of the villagers.

- Training to members of Self Help Groups (SHGs) for generating income for sustainable livelihood.
- Rural youths were trained on vocational enterprises like mushroom production, aquaculture and floriculture to establish new venture for self employment.
- Demonstrated through FLDs on high yielding (Maize RCM 76, paddy RCM 10, Tomato Arka Rakshak/Araka Samrat) and hybrid varieties (Broccoli Aisharya, Cabbage M139) with proper package of practices.
- Large scale demonstrations were conducted for using single bud techniques of ginger variety Nadia and turmeric var. Megha turmeric 1 of size 15-20 g per pit to reduce seed cost .
- Demonstrated on processing and value addition of turmeric into powder and empowered women SHGs.
- Demonstrated and tested HYVs of cabbage, tomato, capsicum, broccoli, etc with intensive training and demonstration on use of plastic and straw for mulching.
- Demonstrated low cost polyhouse structures to rural youths for vegetables nurseries to meet the demand of good quality seedlings in the village along with off-season vegetables (tomato and cucumber) cultivation to fetch higher return.
- Training and demonstration on use of organic and inorganic pesticides through custom hiring

centre (CHCs), where they make use of sprayer at nominal rate decided by themselves.

- Popularized Integrated Pest Management (IPM), Integrated Disease Management (IDM) and Integrated Nutrient Management (INM) in cereals, vegetables and fruits.
- Demonstrated backyard Poultry (Vanaraja, Shreedhi & Kuroiler) and piggery (Hampshire cross) in deep litter system.
- Demonstrated Fish-pig/poultry Integrated farming system
- Introduced and demonstrated the secondary source of income round the year through cultivation of Oyster mushroom (summer variety: *Pleurotus sajor caju*, winter variety: *Pleurotus florida*, PL-14-02 etc)
- Women groups were trained on home scale production of value added products, their packaging and branding for increasing the farm income. The surplus of vegetables such as tomato, carrot, locally available fruits like pineapple, sohsang (*Elaegnis latifolia*), sohphi (*Myrica esculenta*) , Star fruit (*Averrhoa carambola*) were processed into pickles, squash, ketchup etc.

Impact of the Programme

KVK Ri-Bhoi has undertaken various interventions and popularized technology through innovative extension methods in the Madan Nonglakhiat village with the introduction of new varieties, good quality seeds, planting materials etc with package of practices during the last three years. The yield has increased from 12 to 64 per cent in vegetables and 341 per cent in spices. The average growth rate in pigs was found to be 29 per cent with 16 per cent decrease in mortality and 52 per cent increase in income in the village. Similarly, egg and meat production in backyard poultry has increased by 76 and 100 percent over the traditional breeds and practices with 69 per cent increase in income. The other interventions like



Table 1. Yield of important vegetable and spice crops in DFI village Madan Nonglakhiat

Sl. No.	Name of Crop	State Average yield (q/ha)	Village Average Yield (q/ha)				Increase in yield (%) 2017 - 2020
			Before 2017	2017-2018	2018-2019	2019-2020	
1	Tomato (Var. Arka Rakshak, Arka Samrat)	154.92	152.00	198.56	215.67	235.32	54.81
2	Cabbage (Var. Mahy 139, Wonder Ball)	219.11	218.44	228.65	235.33	245.65	12.45
3	French bean (Var. Arka Anoop)	66.81	59.00	62.56	75.10	82.55	23.55
4	Broccoli (Var. Aishwarya, Green magic)	110.00	108.67	134.56	140.76	168.90	55.42
5	Garden pea (Var. Arka Priya)	64.72	60.00	75.56	80.75	98.50	64.16
6	Ginger (Var. Nadia)	62.74	65.12	120.56	155.00	196.32	201.47
7	Turmeric (Var. Turmeric)	58.11	50.00	100.00	168.56	220.54	341.08
8.	Vegetables under Polyhouse	NA	NA	198.00	225.88	256.12	256.12

Mushroom production generated income of Rs. 16700/- in a year. The village groups collectively generated an income of Rs. 18747/- by processing and value added products like pickle, squash with surplus vegetables.

As a result of the successful interventions in the villages during the last three years (2017-20), the monthly average income of the farm families has increased by 15, 40 and 78 per cent,

respectively from Rs. 6136.00 to Rs.10904.00 from all the sources.

Dissemination of the Newly Adopted Technology

The innovative extension interventions made by KVK Ri-Bhoi in the DFI village Madan Nonglakhiat and inspired by the easy method of cultivation, good yield and economy of produc-

Table 2. Average monthly income in the village before and after implementation of DFI Programme

Sl. No	Crop/Enterprises	Average yearly income (Rs.) in the village			
		Before Interventions	After Interventions		
		2016-2017	2017-2018	2018-2019	2019-2020
1	Vegetables and Spices	195700	249728	321537	429267
2	Livestock (Piggery & Poultry)	53500	89552	157684	213836
3	Mushroom & others secondary agriculture	87500	95670	109205	116887
4	Value addition and Processing	0	12540	34421	58747
6	Fishery+ pig/poultry IFS	28500	41565	74876	128480
7	Cereals and pulses	89468	93270	99521	132256
5	Wages, services and other sources	392100	393637	394632	425408
	Average monthly income of 138 farm families	6136	7072	8636	10904



tion, farmers, farm women and rural youth from nearby and surrounding villages have started practicing HYVs of vegetables, fish cum pig/poultry IFS, improved breed of pigs, backyard poultry, oyster mushroom cultivation etc in large scale.

The success of this village has acted as an eye opener for nearby six villages (Nongtraw, Lumshyiap, Khapmara, Nongpyndet, Kyr deng and Lumdiengngan) and extended the horizontal diffusion of the newly adopted methods and technologies to nearly 3250 farmers covering an area of 455 ha to these villages for adoption and gained popularity. Rural youths of these villages have been attracted to agriculture and want to be an entrepreneur. KVK has trained additional 30 school dropouts of the village for skill and entrepreneurship development through protected floriculture, mushroom cultivation and aquaculture. Different NGO's like RRTC, SACH, Bethany Society, Mumbai based AFC India Ltd, FXB International etc decided to replicate this successful programme especially Integrated Farming System (IFS) in different blocks of the district through the Skill Development programmes under Meghalaya State Skill Development Society, Government of

Meghalaya. KVK is instrumental in imparting technical support in this regard.

Conclusion

The dream of Hon'ble Prime Minister of India to double the farmer's income by 2022 is gaining direction and momentum with the pilot project at Madan Nonglakhiat village under KVK Ri-Bhoi by enhancing the household income by 78 per cent within the last three years. It was observed that masses are enthusiastic and ready to adopt, absorb and diffuse farmers' friendly and income generating, sustainable technologies. But in the coming years, there will be requirement of cold storages in the block level where farmers would be able to store their product during the market glut and look for distant markets. Market linkages are another factor which would play a pivotal role in increasing farm income. KVK Ri-Bhoi has taken initiative to form Farmers Producer Organization (FPO)/ Farmers Producer Company (FPC) for helping the farmers to link market to get good quality inputs and better price for their produce in time to sustain and double the income.

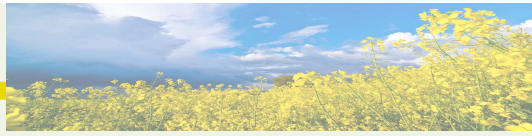
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Direct marketing at farmers door step

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- which faces 10 % additional price than MSP of the major crops.
6. RFPCL has made vast quantity of seed available in neighboring and distant farmers.
 7. To meet the seed demand of farmers during lock down, RFPCL has dropped seed bag at farmers door step and reached farmers with seed in time for planting.
 8. RFPCL has made available other critical agri input and soil testing services to the farmers.
 9. FPO is gaining support and confidence from farmers which is reflected in its membership.
 10. Supported for direct marketing at the door step of the farmers.



Mite Infestation- A New Threat to Sustainable Rice Production in India

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Rice continues to remain as the staple food for more than 65 per cent Indian population with the largest area under rice cultivation in the world (44.6 million hectares i.e. 24 % of the gross cropped area) and ranks second in production (104.3 million tones) (Prakash *et al.*, 2014). Besides, meeting the caloric demand of the growing population, it also provides employment opportunity to the major chunk of the rural community. Hence, its sustainable production is of paramount significance for ensuring food and livelihood security of the country. Rice is subjected to different abiotic (submergence, moisture stress, salinity, alkalinity, nutrient deficiency, iron toxicity and algal blooms) and biotic stresses (insect pest, disease, nematodes, mites, weeds etc.) contributing towards substantial yield loss. Nearly 300 species of insect and non insect pests attack the rice crop from nursery to harvesting stage and among them 23 species cause notable damage (Pasalu and Katti, 2006). While in 1965 only three insect pests (yellow stem borer, gall midge and green leaf hopper) caused economic damage to the crop, by 2015 as many as 20 insect and non-insect pests started infesting rice and cause heavy economic damage. There has been a changing pest scenario

in rice ecosystem mostly induced by the changes in climatic condition, cropping pattern and cultivation practices. The minor pests like leaf folder, BPH, WBPH and hispa are now considered as major pests, sporadic pests like swarming caterpillar, climbing cut worm are regularly infesting the crop and the major pests like stem borer and gall midge are either developing resistance to pesticides or developing biotypes to infest the resistant varieties. Wide spread cultivation of rice throughout the year, modification of crop micro environment through adoption of high yielding varieties with minimum host plant resistance mechanisms, expansion in irrigation facilities, increased application of chemical fertilizers and indiscriminate application of insecticides have not only resulted in the population build up of the regular insect pests of rice, but contributed to the outbreak of secondary pests and appearance of new pests.

Rice sheath mite, *Steneotarsonemus spinki* and leaf mite, *Oligonychus oryzae* are the two most important non-insect pests started appearing in the rice eco-system and under favourable condition pose a serious threat to sustainable rice production in the country. Excessive and indiscriminate application of synthetic pyrethroids and their com-

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mination products to control insect pests like stem borer, leaf folder and plant hoppers normally leads to resurgence of mite pests. Early season and prophylactic application of chemical pesticides cause wide spread killing of predatory mites that ultimately leads to outbreak of mites in the later stage of crop growth. Therefore, it is very essential to develop some understanding about the seasonal incidence, biology, damage symptoms and recommended management strategies of these emerging pests of rice.

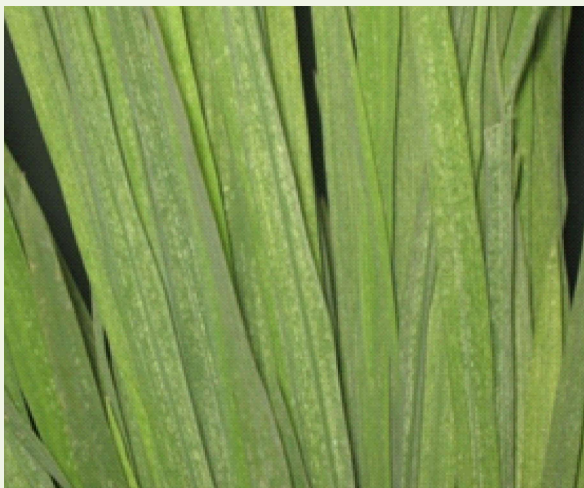
Rice leaf mite, *Oligonychus oryzae* Hirst. (Acari: Tetranychidae):

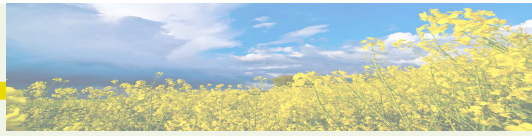
Rice leaf mite has attained a pest status recently in many rice growing areas of India and infest the crop from nursery to stem elongation stage. They are small and microscopic spider mites where, both the nymphs and adults suck the cell sap and cause damage to the mesophyll cells of the interveinal tissues. This resulted in characteristic whitish patches on leaves that later turned to ash colour and dried from tip down-ward (Misra & Israel, 1968). Heavily infested plants look pale due to loss of chlorophyll on the leaves and later the whole leaf turns to greyish white and dries up. Loss in

grain yield occurred due to reduced photosynthetic activity of plant. They multiply very fast under congenial conditions and total life cycle will be completed in about 15 to 18 days. Bright sunny weather followed by light rain during September to October was congenial for the multiplication of this mite. In the absence of rain, prolonged dry climatic conditions provide a congenial atmosphere for the multiplication of mites (Misra & Israel, 1968). Naya k (2017) have observed that higher level rice leaf mite occurrence in areas of incessant rain coupled with high temperature followed by indiscriminate use of agro inputs. Besides rice, several weeds like viz., *Panicum coloratum* L., *P. crusgalli* L., *Cyanodon dactylon* L. and *Echinochloa colona* L. have been reported as alternate hosts for *O. oryzae* (Nagarajan, 1957 and Misra et al., 1968). Leaf mite incidence was more during September and October and among the weather factors maximum and minimum temperature had significant positive correlation whereas, morning and evening relative humidity and Rainfall exerted negative correlation with mite population (Chitra et al., 2017).

Rice Sheath Mite/ Panicle Mite, *Steneotarsonemus spinki* Smiley (Acari: Tarsonemidae) :

It is a small microscopic tarsonemid mite only visible under 20 X lens in the compound microscope. They are present in colonies, in the intercellular space of the leaf sheaths of rice plants and occasionally, they are also present in basal part of the midrib of leaf blades. These remain and multiply throughout the vegetative phase of plant growth causing brown discolouration of flag leaf sheath During the reproductive phase of the crop growth, *S. spinki* migrate to the developing grains in milky stage and cause spikelet sterility and discolouration





of filled or ill-filled grains (Srinivasa *et al.*, 2004 & Sogawa, 1977). Deformed panicles and inflorescences, lesions on the inner surface of leaf sheaths and browning of rice hulls are also caused by this mite (Ramos and Rodriguez, 2001). This mite has also been reported as vector/carrier of pathogenic fungi like *Acrocyndrium (Sarocladium) oryzae*, *Fusarium moniliformae*, *Helminthosporium oryzae*, *etc.* (Rao *et al.*, 2000). However, in association with sheath rot fungus, (*Acrocyndrium oryzae*) it causes grain discoloration, ill-filled, chaffy grains and often cause heavy losses. Yield losses ranging from 30-90% have been reported from many parts of the world (Navia *et al.*, 2006). The occurrence of rice sheath mite has been reported from many countries in the world and in India, it was reported for the first time from Orissa (Rao *et al.*, 1997). Sheath mite was observed to cause significant reduction in yield of rice crop in Gujarat and West Bengal (Anonymous, 2007-09). Rice sheath mite is a regular mite pest occurs in kharif rice under Gangetic Plains of West Bengal causing 15 to 60% yield loss in susceptible rice cultivars depending on the time of transplanting (Karmakar, 2008). A temperature range of 25 – 28 °C was found to be optimum for the development and multiplication of sheath mites and normally its infestation becomes very serious from 80 DAT and reaches its peak during 100 to 120 DAT. Weather parameters like maximum and minimum temperature, maximum and minimum

relative humidity and total rainfall have been observed to be a positive correlation with the mite population. The mite population grow tremendously at high temperatures and high humidity during last fortnight of September and sometimes continue to 1st fortnight of October that synchronizes with the panicle emergence stage of the short and medium duration rice cultivars in West Bengal Condition. The life cycle is completed in 6 days (Sogawa, 1977). However, the duration of different stages and the total duration of the life cycle is highly temperature dependant. Rice is the major host of *S. spinki* and it survives in stubbles and rations during off-season. There were many alternate hosts like *Schoenoplectus articulatus*, *Cyprus difformis*, *Cyperus rotundu*, *Echinochloa colonum* and *Cynodon dactylon* on which *S. spinki* survive and infest the rice crop later.

Integrated Management Strategies Against Mite Pests of Rice

- Balanced fertilizer application and avoid excessive application of nitrogenous fertilizer. Adoption of Integrated Nutrient Management (INM) with green manuring, biofertiliser, neem cake and soil test based fertilizer application will reduce mite infestation.
- Destruction of weeds and alternate hosts can contribute to lower incidence of mites.
- Avoid excessive application of synthetic pyrethroids and their combination products during active tillering and reproductive stage of the crop to avoid resurgence of mites.
- Conservation of predatory mites like *Amblyseius taiwanicus* can suppress mite pest population naturally, therefore, early season application of pesticides may be discouraged
- Foliar application of neem based formulations at early stages of infestation may

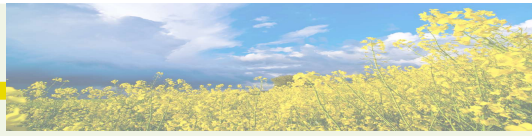


be recommended.

- Foliar application of insecticide Profenofos 50 EC @ 1 l/ ha during the active tillering stage can be recommended to target both insect pests (stem borer & leaf folder) and mites as this insecticide has good acaricide action. Profenophos imparted relatively higher mortality of sheath mite and the highest yield was also obtained from profenophos treated plots. (Karmakar et al, 2017).
- Need based application of acaricides like Fenpyroximate 5 SC @ 250 ml/ ha, Propargite 57 EC @ 1 l/ ha, Fenazaquin 10 EC @ 750 ml/ ha, spiromecifen 22.9 SC @ 400 ml/ ha can reduce the mite infestation. Acaricides of different mode of action can be applied in rotation to delay the resistance development process.

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Guava cheese: Nutritionally important value added product

Dr. Rashmi Shukla and Y.K. Shukla



Guava (*Psidium guajava* L.) is an important fruit of the world. It has been cultivated in India, since early 17th century and gradually became a crop of commercial significance. In terms of area and production, it is the fourth most important fruit crop of India after mango, banana and citrus. At present, it occupies nearly 1.12 lakh hectare of land with production of 12.04 lakh tons and productivity 10.77 ton fruits / hectare / year in India (DAC, 2007). Guava is grown practically in all the states of the country and excels to most other fruit crops in productivity, hardness and adoptability. In India, guavas are grown in Uttar Pradesh, Bihar, Madhya Pradesh and Maharashtra in large scale. In Madhya Pradesh, guava occupies about 6921 hectares area with the production of 138420 tonnes of guava fruit per year (Horticulture Statistics of M.P. 1998-99).

Guava is the poor man's fruit or apple of tropics. The guava tree is a medium sized shrub about 9 meters high. This tree yields a very good crop with little attention. It has profuse bearing of fruits every year and fetches handsome returns without use of much input. In Madhya Pradesh guava is harvested in two crop seasons; one in rainy season and other in winter season. The fresh guava fruits are available in the market throughout the year. The qualities of winter season fruit crops are

better than that of rainy season fruits. The mature fruits of winter season crop can be stored up to 6 to 9 days under ambient conditions, while those of rainy season could be stored up to 2 to 4 days depending upon the variety. The guava varieties which are mainly grown in central India are Allahabad Safeda, Lucknow-49 and Apple guava. These varieties have immense commercial importance due to yellowish white colour, sweet taste with mild flavour pulp quality.

Guava is considered as one of the exquisite, nutritionally valuable and high remunerative crop. It is an important component of human dietary system. The guava fruit is an excellent source of ascorbic acid (260 mg/100 g), pectin (0.52 to 2.0%), phosphorus (23 27 mg/100 g) and calcium (14-30 mg/100 g). The fresh fruit of guava also provides vitamins like niacin, pantothenic acid, thiamin, riboflavin and vitamin A. Immature fruits of guava are used in treatment of gastroenteritis, diarrhea, dysentery, blood pressure and cardiovascular diseases. In the last couple of years, India has emerged as a major producer of horticultural crops by producing 50 million tonnes of fruits every year; however their export potential is limited due to the poor post harvest management, processing and utilization technology. In Madhya Pradesh, guava growers generally take Mrig Bahar

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crop. The occurrence of seasonal glut is very often. The farmers sell their fruit produce at throw away prices. The storage of fruits is very difficult for longer period because of its perishable nature, especially under tropical conditions. It is common experience that 20-25% fruits are completely damaged and spoiled before it reaches the consumers

Processing is a very authentic way in value addition of fruit crops to produce food products for generating additional source of income and employment. Processing makes the products free from unwanted fractions and transform it in to more useful form and thereby increasing the shelf life over fresh products. The demand for the processed food products is increased enormously in the country. Therefore, it is an urgent need to pay more attention on the processing of guava fruits as well as the production of acceptable products, so that the growers may get remunerative prices and consumers get opportunity to enjoy the taste of guava in the form of food products. Presently guava varieties are utilized for production of jam, jelly, pulp, puree, toffee, leather, juice, baby foods, beverage base, syrup and wine Apart from above products, guava pulp is also being used for preparation of new product like cheese.

As far as consumer taste is concerned, consumption of regular jam, jelly, paste and puree is changing with modern products. The fruit cheese or cheese like product is gaining importance in the international market. In the last couple of years several attempts have been made to develop the technology for production of guava cheese by utilizing the local varieties but the product quality was not consistent, The systematic information on technology for processing of guava cheese preparation is not available in literature, information on requirement of additives, packaging material, sensory, microbiological quality during storage is quite scanty.

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Preparation of guava cheese

• **Sorting of fruits**

Well ripened healthy and fresh guava fruits of each variety were selected for the study. Over ripened, unripened and rotted fruits were discarded.

• **Washing of fruits**

Before processing, the fruits, were thoroughly washed with tap water to remove the dust, and other undesirable foreign materials adhering on the surface of fruits.

• **Cutting of fruits**

The cleaned fresh fruits were cut into slices of about 1 cm thickness with the help of stainless steel knife for each treatment.

• **Boiling of fruit slices**

The slices of fruits for each treatment were boiled with water continuously till the period, when all slices became completely soft. After this, the boiled slices of fruits of each variety were allowed to cool under natural conditions.

• **Mashing and sieving of fruit slices**

The soft fruit slices were properly mashed manually to facilitate quick and easy method of sieving. After completing the mashing of slices, pulps were used for sieving.

• **Addition of sugar, butter, citric acid and milk powder**

After proper mashing and sieving of fruit slices, the desired quantity of sugar, butter and citric acid were added for preparation of cheese. In other formulation, guava cheese was prepared with milk powder in addition to other ingredients as per treatments.

• **Determination of end point for cheese preparation**

After addition of sugar, butter, citric acid



as well as milk powder in fruit pulp as per treatments, the mixture of pulp was allowed for cooking in a metallic pan by continuous stirring till the period when mixtures became sufficiently thick and started to leave the sides of the pan. This was the end point of cheese preparation, then the pan was removed from the fire.

• **Setting of guava cheese**

The cooked guava cheese after removal from fire was spreaded over butter coated tray of 20 cm x 20 cm size, as per the treatments. One centimeter thickness of the layer of guava cheese was made uniformly in each tray and then allowed for setting for 3 hours.

Material required for guava cheese

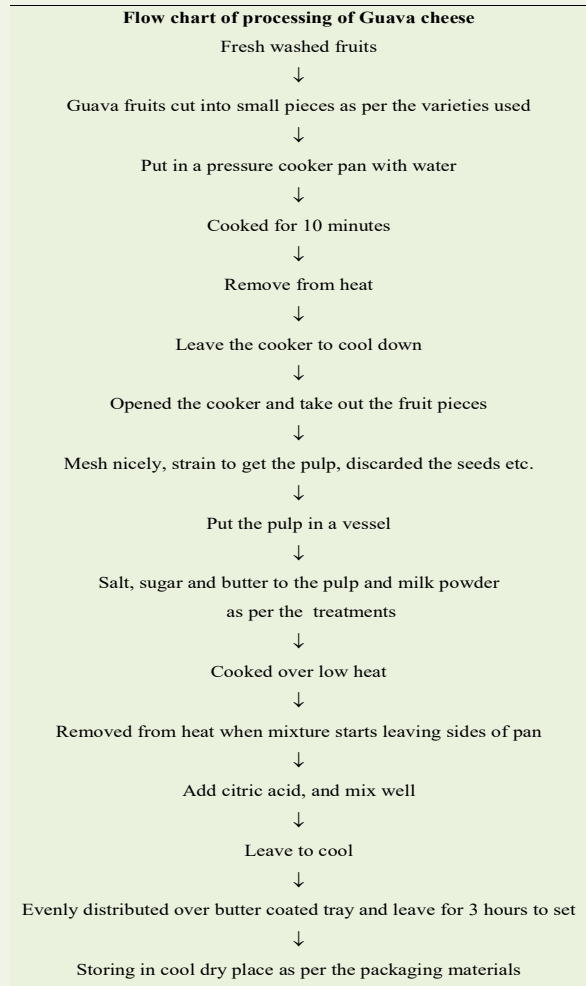
The following material was used to prepare the cheese of guava fruits:

Conclusion: On account of poor post harvest management, processing and utilization technology about 20-25% fruits are completely damaged and spoiled before it reaches the consumers. Therefore, it is an urgent need to pay attention on the processing of guava fruits so that the growers may get remunerative prices and consumers get the opportunity to enjoy the test of guava in the form of the food products.

The following material was used to prepare the cheese of guava fruits:

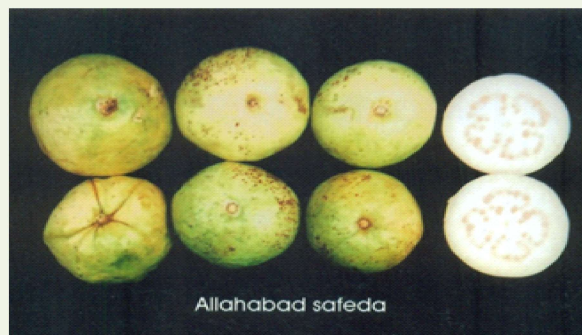
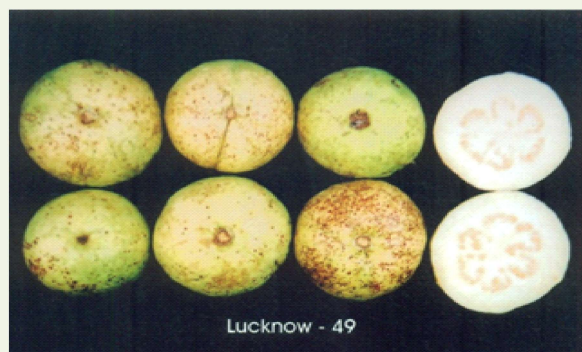
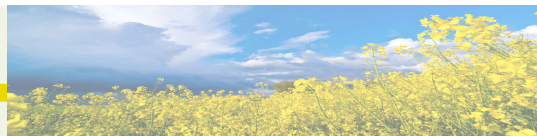
S. No.	Name of material	Quantity	Remarks
1.	Pulp of fresh guava fruits	500 g	Pulp used as per variety
2.	Sugar	500 g	-
3.	Butter	100 g	-
4.	Milk powder	100 g	As per requirement
5.	Citric acid	¼ tea spoon	-
6.	Salt	¼ tea spoon	-

Flow chart of processing of Guava cheese



It has been observed that consumer taste towards the consumption of regular jam, jelly, paste and puree is changing with modern products like fruit cheese. In the international market this product also fetches very high price.

It can be concluded that the fruits



of most popular varieties like Lucknow-49, Allahabad safeda, Apple guava etc can be used for making cheese which is more nutritious and it can be used for longer time and it can also help in correcting malnutrition and better utilization during main season. The quality cheese of guava may be prepared with improved varieties like Lucknow-49, Allahabad safeda, pulp and milk powder simultaneously. The addition of milk powder in cheese had significant effect on the nutrient or minerals (i.e. Calcium, Magnesium, Phosphorus and Iron) content. It had better stability during storage also. Plastic containers and glass containers can be used to check the change in major content of guava cheese. Lucknow-49 variety of guava cheese possessed higher score of acceptability without use of any additives while it was

put in the glass container throughout the storage period.

Guava can be used for processing purpose at domestic as well as commercial level. The guava cheese production technology generated from the study will be helpful for the farmers and development of our nation.

Suggestion for Further Work

- Comparative studies on storability can be done at various temperatures along with different packaging materials.
- Mixed fruit cheese can also be prepared and evaluated.
- Addition of sugar in different proportion while making guava cheese can also be studied.
- Other products of guava pulp in addition to cheese may also be considered for further studies.

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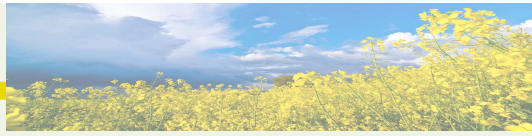
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Ajwain (Bishop's weed) - A useful Herb

Dr.Kavita Sharma



The history of spice is almost as old as human civilization. India may be recognized as the 'The home of spices' They have been used since ancient times. Spices have always been believed to have healing and magical qualities. Spices offer significant health benefits and contribute towards an individual's healthy life. They add flavor and nutrients to dishes without fat or calories.

Among the variety of spices used in Indian cooking, Ajwain seeds (Omum in Tamil) (Bishop's weed) is a staple herb/ spice available in most Indian homes. It is a small, erect, annual shrub with soft fine hairs and traditionally known as a digestive aid and an antiseptic. Botanical name of omum is *Trachyspermum ammi*. The fruits are very small, egg-shaped and gray in colour. Ajwain has a strong, pungent odor and flavor similar to pepper. It is cultivated in Iran, Egypt, Mghanistan and India. The trade name ajwain is based on the Indian name which is derived from *adarjawan*. Ajwain or Bishop's weed has been used as a carminative medicine. Even Greek physicians like Dioscrides and Gelen used it in various carminative medicines. Some very valuable Unani medicines are prepared from ajwain seeds. They contain thymol oil, which gives a taste reminiscent of thyme. It is used in lentil dishes, vegetable parathas, pakoras and meat dishes.

Culinary uses

Ajwain seeds mainly feature in savory Indian, Pakistani, and Middle-Eastern cooking. This beneficial herb is used in culinary process as spice as well as a major ingredient of different kind of medicines. In order to keep the fragrance and flavor intact, ajwain seeds generally crushed just before preparing dishes and added to the cooking recipes at final stages. This is because prolonged cooking results in evaporation of essential oils.

- In Punjab province of India and Pakistan, the spice seeds particularly added to make bread known as *ajwain paratha*.
- Some Indian vegetarian bean/lentil and chicken/fish curries contain this spice and in the Middle-East, it is used to flavor meat and rice dishes.
- The seeds are generously used in snacks, spicy biscuits to flavor drinks, soups, sauces in India.
- They are also used in pickling along with fenugreek, mustard seeds, turmeric etc.



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Nutritional and Medicinal Properties of Ajwain :

The ajwain seeds has following nutrients:

Calcium, phosphorus, iron, carotene, thiamine,

Sr.No.	Particulars	Percent/100gms
1.	Moisture	7.4
2.	Protein	17.1
3.	Fat	21.8
4.	Minerals	7.9
5.	Fibre	21.2
6.	Carbohydrates	24.6

riboflavin and niacin are amongst the vitamins and minerals in it. Its calorific value is 363.

The seed are stimulant and are useful in counteracting spasmodic disorders. The oil of ajwain is an almost colourless to brownish liquid with characteristic odour and a sharp hot taste. Steam distillation of crushed seeds yields an essential oil which is strongly antiseptic, antispasmodic, digestive, diuretic and expectorant. If the liquid is allowed to remain undisturbed, a part of the thymol may separate from the crystals, which is sold in Indian markets under the name of *ajwain ka phul* or *sat ajwain*. It is much valued in medicine as it has nearly all the properties ascribed to the *ajwain* seeds. In India, where any amount of tap water can result in arbitrary complications, ajwain often comes to the traveller's rescue: Just chew one spoonful of the fruits for a few minutes and wash down with hot water. In the West, thymol is used in medicines against cough and throat irritation.

Gastro-Intestinal Disorders

Bishop's weed has long been used in indigenous medicine for the treatment of diarrhoea, dysentery, atonic dyspepsia, cholera, colic, flatulence and indigestion. For relieving flatulence, dyspepsia and spasmodic disorders, the seeds may be

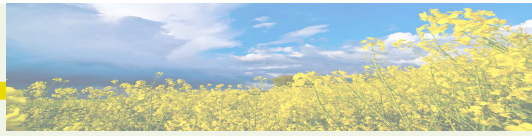
eaten with betel leaves. A teaspoon of these seeds with a little rock-salt is a household remedy for indigestion. Take some ajwain, a pinch of salt and add some lime or lemon juice, let the lime juice get completely absorbed inside the Ajwain, once it feels dry store it in a glass bottle, take a pinch of this Ajwain and chew it, it is an excellent digestive aid while suffering from flatulence (gas). In southern parts of India dry ajwain seeds are powdered and soaked in milk, which is then filtered and fed to babies. Many assume that it relieves colic in babies and for kids it also improves digestion and appetite. In North part of India, Ajwain is used after having heavy meal, usually after party dinner. Fried Omum seeds are eaten raw. Fried and ground Omum seeds are added to dishes, it helps in digestion.

The volatile oil extracted from the seeds is also useful in cholera, flatulent colic, diarrhoea, atonic dyspepsia and indigestion. It is usually given in doses of 1 to 3 drops. Omum water, that is, the water distilled from the seeds, is an excellent carminative that relieves flatulence and is antispasmodic in colic and flatulence. It is also administered in the early stages of cholera in doses of 30 to 60 grams to check vomiting.

In case of colic, ajwain, dry ginger and black salt in the proportion of 1 : 1/2 : 1/4 should be ground together and taken in three gram doses with warm water. In case of flatulence, ajwain and dried ginger in equal weight may be soaked in two and half times the quantity of lime juice. This is then dried and powdered with a little black salt. About two grams of this powder is taken with warm water.

Respiratory Disorders

A mixture of the seeds and buttermilk is an effective remedy for relieving difficult expectoration caused by dried up phlegm. The seeds are also effective in bronchitis. A hot fomentation with the seeds is a popular household remedy for asthma. Chewing a pinch of ajwain seeds with a crystal of



common salt and a clove is a very effective remedy for cough caused by acute pharyngitis in influenza.

Common Cold and Nasal Congestion

Bishop's weed is an effective common cold remedy. It has a remarkable power to open up clogged and congested nasal passages. A tablespoon of seeds crushed and tied up in a cloth bundle can be used for inhalation. A similar bundle placed near the pillow, while sleeping, also relieves nasal congestion. For infants and small children, a small pouch can be pinned to their dress under the chin when they are sleeping. In case of adults, a teaspoon of the seeds can be put in boiling water and the vapors inhaled. Ajwain's germicide and antiseptic properties are utilized in many cough syrups.

Bronchitis:

If you have chronic bronchitis and asthma, take the mixture of ajwain and jaggery, heat it to make a paste and take 2 teaspoonfuls twice a day. However, diabetics should not take this preparation because of the sugar content. It helps to bring out the mucus easily and alleviates chronic bronchitis and asthma to great extent. It also helps in getting relief from chronic cold.

Curing influenza: A person suffering from influenza should drink the boiled water with 3 gms of ajwain and 3 gms of cinnamon bark for 3 days, thrice a day. This helps in curing influenza to a great extent.

For Alcoholics:

If people who consume excessive alcohol develop discomfort in the stomach, taking Ajwain twice a day, will be very useful. It will also reduce the craving and desire for alcohol.

Heart:

Taking one teaspoon of Ajwain with hot water stimulates the heart and relieves heartache.

Migraine

The seeds are useful in the treatment of migraine and delirium. They should either be smoked or sniffed frequently to obtain relief.

Rheumatism

The oil extracted from the seeds is beneficial in the treatment of rheumatic and neuralgic pains. It should be applied on the affected parts.

Mouth Disorders

An infusion of the seeds mixed with common salt is an effective gargle in acute pharyngitis, sore and congested throat and hoarseness of the voice due to colds or shouting.

Earache and Toothache

The herb is beneficial in earache. About half teaspoon seeds are heated in 30 ml of milk till the essence of the seeds permeate the milk. The milk is then filtered and used as ear drops. It decreases congestion and relieves pain.

In case of pain caused by boils in the ear, 3 grams each of ajwain seeds and garlic are boiled together in 40 grams of sesame oil till they turn red. The oil is then strained and cooled to body temperature, and used as ear drops.

The smoke of burning ajwain seeds is effective in treating toothache. Gargle with lukewarm water prepared by boiling of ajwain and little salt two to three times a day, it cures tooth pain.

Other Uses :

Beside these ajwain helps in curing the disorders such as ulcers, menstrual and post-natal disorders, pimples, kidney stones. Helps pregnant women in digesting their food, increases the appetite and keeps the uterus healthy. Ajwain seeds also reduce the craving and desire for alcohol. It is used as anti-oxidants and preservatives in medicine.



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