TECHNOLOGY HANDOUT 2023

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ISBN: 978-93-89490-82-4

Printed at

LOIS BET
Print & Publication
Chanmari, Aizawl-796007
Mizoram, Ph. 0389-2349250

Published by

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Preface

Agriculture has always been the backbone of our nation, contributing significantly to the socio-economic fabric of our communities. In the pursuit of sustainable Agricultural practices, Krishi Vigyan Kendras (KVKs) play a vital role in bridging the gap between scientific advancements and the farming community. It aims at assessment of location specific technology modules in Agriculture and allied enterprises developed by ICAR institutes, SAUs, CAUs and other R&D organization including ITK through technology assessment, refinement and demonstrations. KVKs serve as knowledge and resource centers for the farming community and play a pivotal role in disseminating advanced Agricultural technologies and practices to enhance Agricultural productivity and improve the socio-economic conditions of farmers.

Krishi Vigyan Kendra (KVK), Lawngtlai District, Lawngtlai is a prominent Agricultural centre among the eight KVKs in Mizoram, contributing significantly to advancing Agricultural practices and promoting sustainable development in Lawngtlai district. It operates with the support of hundred percent financial sanctions from ICAR-ATARI Zone-VII and is functioning under the administrative framework of Department of Agriculture, Aizawl, Mizoram as host department. KVK Lawngtlai plays a crucial role in addressing the specific needs of farmers within the district and providing the need based solution to such problems with utmost sincerity and enthusiasm. By conducting on farm trials and Frontline demonstrations, KVK Lawngtlai contributes to the development of innovative and sustainable farming practices that are well-suited to the Agro-ecological conditions of Lawngtlai district.

The content within this publication is the documents that incorporate the latest Agriculture and allied technologies tested by KVK Lawngtlai through OFT/FLD during the year 2012-2022. I hope that this KVK Technology Handouts serves as a beacon of knowledge and inspiration for all stakeholders involved in the Agriculture and allied sector. May it contribute significantly to the growth and success of our Farming communities. I sincerely acknowledge the efforts rendered by the staff of KVK Lawngtlai for their contribution in bringing out this publication successfully.

Dr A.K.Mohanty
Director of ATARI
Zone-VII, Umiam, Meghalaya,
INDIA

Editorial

In the fertile landscape of scientific exploration, agriculture stands as the bedrock of human sustenance and progress. As we delve into the pages of this Technology handout, it is an opportune moment to celebrate the strides made in understanding, innovating, and sustaining the very foundation of our civilization—our connection with the land.

Agricultural research has transcended traditional boundaries, evolving into a dynamic field where innovation thrives. This Technology Handout serves as a crucible for these pioneering ideas, where each article is a testament to the commitment to feed the fast growing Lawngtlai District population while mitigating environmental impact.

As we peruse the contents of this Technology handout, we recognize the role it plays in nurturing the next generation of agricultural leaders. By disseminating cutting-edge research, fostering mentorship, and encouraging interdisciplinary exploration, this journal contributes to the growth of a vibrant community dedicated to steering agriculture into a sustainable and prosperous future for Lawngtlai District, Mizoram.

In conclusion, this editorial celebrates the richness of knowledge contained within the pages of this agricultural research journal. As we cultivate a deeper understanding of the intricate tapestry of agriculture within Lawngtlai District, may the insights shared here inspire further research, innovation, and collaboration to ensure a bountiful harvest for generations to come.

Editor-in-Chief

Dr C Lalfakawma
Sr. Scientist & Head

Performance of Groundnut *var. Girnar-4*

Introduction

Groundnut is one of the most important oilseed crops in India. *Girnar-4* is newly released bio-fortified variety of Groundnut by ICAR-DGR and ICRISAT in the year 2020. The content of Oleic acid in *Girnar-4* is 80% comparing to 50% in normal Groundnut and this high content of Oleic acid can reduced risk of developing heart disease and also this groundnut oil is having the property for extending shelf life of food product which is very beneficial for food industries. On Farm Trial on Girnar-4 was conducted by KVK Lawngtlai district for three consecutive years and found very suitable to Lawngtlai district.

Technology Details *(ICRISAT, 2020)*

Variety – *Girnar-4,* NPK – 20:60:40 kg/ha, Spacing – 30cmx15cm, Carbendazim, Dichlorvos, Seed rate – 80-100 kg/ha, Sowing time – June, Harvesting –September

Result and Discussion

The vegetative growth and development of *Girnar-4* was very good under kharif rainfed condition. The average productivity of *Girnar-4* was 22.7 q/ha and 35.3 pods per plant. 100 seed weight was 85 g. The plant height was 56.3 with average branches per plant was 10.6. The crop duration of *Girnar-4* was 115 days. *Girnar-4* was superior to ICGS 76 in many yield attributes. It showed moderate tolerance to pests and diseases.

Table 1: Different parameters recorded on Girnar-4 & ICGS 76

Parameters recorded	Result (3 years)	
	Girnar-4	*ICGS 76*
Crop duration (days)	115	120
No. of pods/plant	35.3	24.2
100 seed wt. (gm)	85	95
Plant height (cm)	56.3	56.4
Productivity (q/ha)	22.7	20.3
BC ratio	2.7	2.49

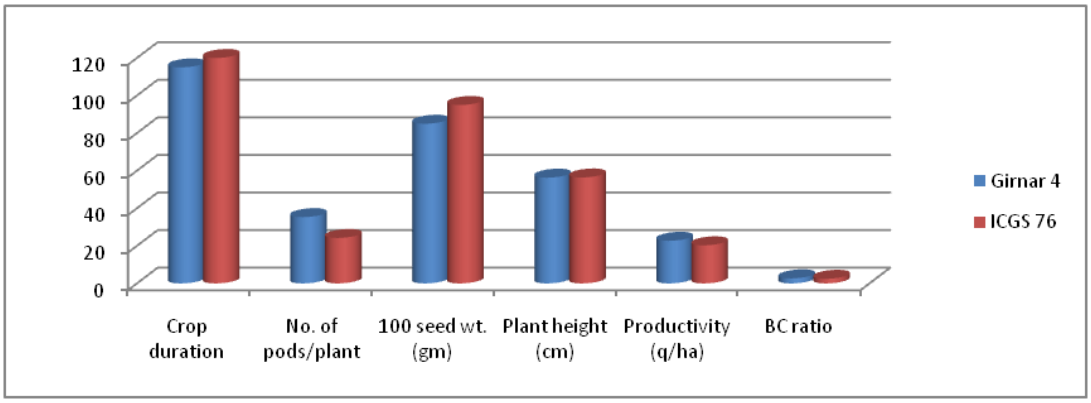


Fig. 1: Comparison of different parameters of Girnar-4 & ICGS 76

Conclusion

The overall performance of Girnar-4 indicated its suitability to the climatic and soil condition of Lawngtlai district and therefore, it can be recommended for large scale production within Lawngtlai district and different part of Mizoram. One of the best characters of *Girnar-4* is increasing fertilizer dose increases the productivity without causing infertility to seed formation which is common in *ICGS 76* and other Groundnut varieties. This variety need to be popularized among the farmers as there is very high demand for health conscious people and for food industries.

Action Photo

Performance of Rice (var. CAU R1)

Introduction

Rice is the most important and extensively grown food crop. With many constraints producing more rice from the same land to feed additional population is a great challenge. Selection of appropriate variety and improve management practices is principle factors attributed to yield. CAU-R1 was released from Directorate of Research, Central Agricultural University, Imphal, Manipur in 2008. It is glutinous rice which is preferred by many local people and it won award for many times. It is high yielding variety with potential productivity of 5-6 ton/ha. under wetland condition and it can also be cultivated under upland condition with productivity of about 2 ton/ha.

Technology Details (CAU, Imphal 2008)

Variety – CAU R1, NPK –60:40:40 kg/ha, Spacing – 30cmx30cm, Seed treatment with Carbendazim, Dichlorvos for insect control, Seed rate 50kg/ha, Sowing time – July, Harvesting time – November.

Result and Discussion

The vegetative growth and development of CAU R1 was very good. The productivity was 52 q/ha with 115 days crop duration. CAU R1 recorded better yield attributing characters than other varieties *viz;* panicle length, grains per panicle, test weight, grain yield and less number of unfilled spikelet per panicle. It is non-lodging and non-shattering, moderately susceptible in rice blast and BLB under controlled conditions. High productivity may be due to deeper and longer spreading of roots which indicated better absorption of water and nutrients.

Table 2: Different parameters recorded on CAU R1 & RCM 7

Parameters recorded	Result (2 years)	
	CAU R1	RCM 7
Crop duration (days)	115	110
Effective tillers/plant	13.4	14.8
No. of grains/panicle	278.6	234
Plant height (cm)	130	159
Productivity (q/ha)	52	44.8
BC ratio	2.2	1.9

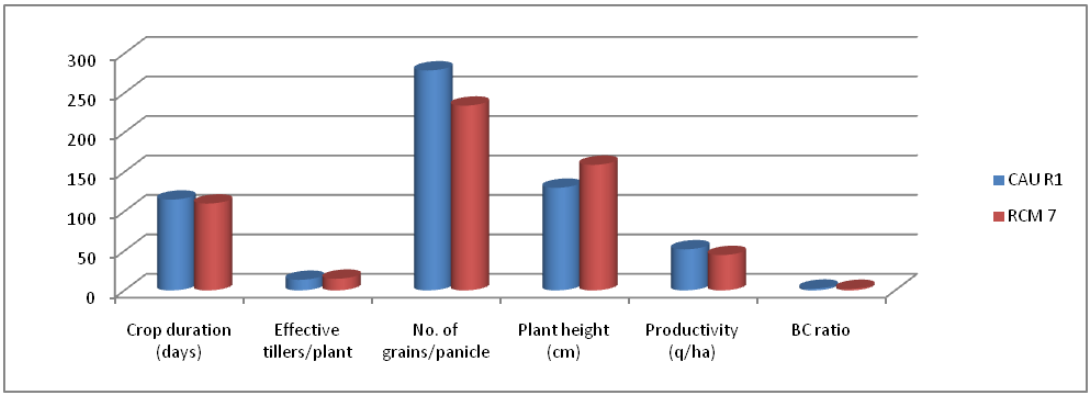


Fig. 2: Performance of CAU R1 and RCM 7

Conclusion

Rice variety CAU R1 showed very good result that indicated suitability for cultivation within Lawngtlai district and other part of Mizoram. Due to its high yielding ability and local preference for consumption it should be popularized. Some disadvantages are high chaffy grains under high level of Nitrogen application and Non shattering or difficult to thresh. Therefore, grower of this rice variety need to be expert if they are going to use fertilizer and farmer should also be provided threshing machine to convince them instead of doing threshing manually.

Action Photos

Performance of Lentil (HUL 57)

Introduction

Lentil is a valuable human food, easy to cook and easily digestible with high biological value. It is commonly consumed as Dal. India is one of the major pulse producing countries in the world but the average productivity in India is significantly poor (714kg/ha) far below the world average productivity 1008 kg/ha. Lentil requires cold climate which make it the right crop for cultivating in the fallow land during rabi season. Lentil variety HUL 57 is small seeded and hardy variety which was released in 2005 by BHU, Varanasi. Lentil crop cultivation is new for most of the farmer in Mizoram but it is consumed by all the people. A Trial was conducted in 2022 and found that it can be successfully cultivated in Mizoram. Wider adoption of Lentil is needed in order to meet the increasing demand.

Technology Details (Banaras Hindu University (BHU), 2005

Variety – HUL 57, NPK – 20:60:40 kg/ha, spacing – 30cmx5cm, Carbendazim, Chlorpyriphos, seed rate – 40-45 kg/ha, sowing time – October - November, Harvesting time –February- March

Result and Discussion

The average yield of Lentil Variety HUL 57 was 6.89q/ha which is near to the national average productivity but yield of check variety (6.53q/ha.) is lower. The crop was ready for harvest after 125 days and it has 118.2pods/plant. The average height of HUL 57 was 42 cm. The technology gap in the demonstration yield over potential yield may be attributed to the dissimilarity in the soil fertility status and weather conditions. No serious pests and diseases problem found during cropping season.

Table 3: Different parameters recorded on HUL 57 & IPL 526

Parameters recorded	Result (3 years)	
	HUL 57	IPL 526
Crop duration (days)	125	128
No. of pods/plant	118.2	105.3
100 seed wt.	3.1	3.5
Plant height (cm)	42	41
Productivity (q/ha)	6.89	6.53
BC ratio	2.7	2.4

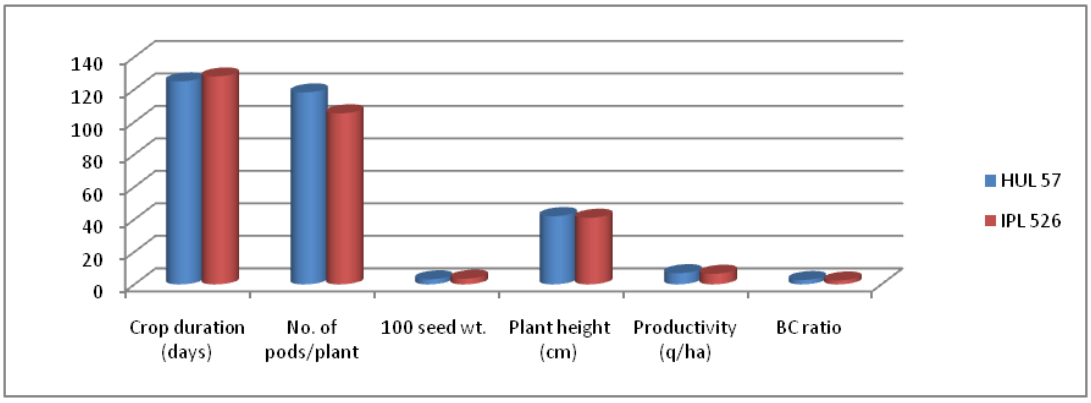


Fig. 3: Performance of HUL 57 and IPL 526

Conclusion

Lentil is a small seed grain legume but nutritionally mighty member of legume family requires popularization and adoption. Development of agronomical practices for the cultivation of lentils in rice fallow may provide an opportunity for the socio-economic development of the farmers in Mizoram. The present study exhibited significant yield performance of HUL 57 with early maturing suggesting potentiality for the cultivation of lentil in rice fallow situation by adopting early maturing high yielding varieties under agro climatic condition of Mizoram. The unavailability of lentil seed and Hulling machine are the present problem of the farmer that prevented them from lentil cultivation.

Action Photos

Performance of Soyabean var. JS 335

Introduction

Soya bean is an important crop worldwide because of its geographical adaptation, unique chemical composition, good nutritional value, functional health benefits. It is the world first ranking crop as a source of vegetable oil. JS 335 is semi dwarf, non-lodging, non-shattering, early variety and one of the high yielding varieties. This has occupied most of the soybean growing areas created mono culturing. It contain about 40% good quality protein, 20% Oil having about 85% unsaturated fatty acids, 25-30-% carbohydrates and almost no starch, 4-5% minerals, anti-oxidants. The yield potential is 27-30q/ha. It has resistance against girdle beetle and stem fly and tolerance to moisture stress conditions.

Technology Details (IISR, 1994)

Variety – JS 335, NPK – 20:60:40 kg/ha, Spacing – 30cmx5cm, Carbendazim for disease control and Dichlorvos for pest control, seed rate – 75-80 kg/ha, Sowing time – June and August. Harvesting time –September and December.

Result and Discussion

According to the trial conducted, the average productivity of JS 335 was 21.2 which is below its potential yield which may be because of the soil fertility condition of the region. The crop duration was 110 days which is very short in comparison to local variety. The plant height was 46.4 cm and 100 seed weight is 13.2 g. The variety of JS 335 was still superior to improved variety of VL Soya 89 which may be due to better adaptability to the climate and soil condition of Lawngtlai district.

Table 4: Different parameters reading of JS 335 & VL Soya 89

Parameters recorded	Result (3 years)	
	JS 335	VL Soya 89
Crop duration (days)	110	120
No. of pods/plant	37.9	36.4
100 seed wt.	13.2	13.5
Plant height (cm)	46.4	47.5
Productivity (q/ha)	21.2	19.4
BC ratio	2.52	2.30

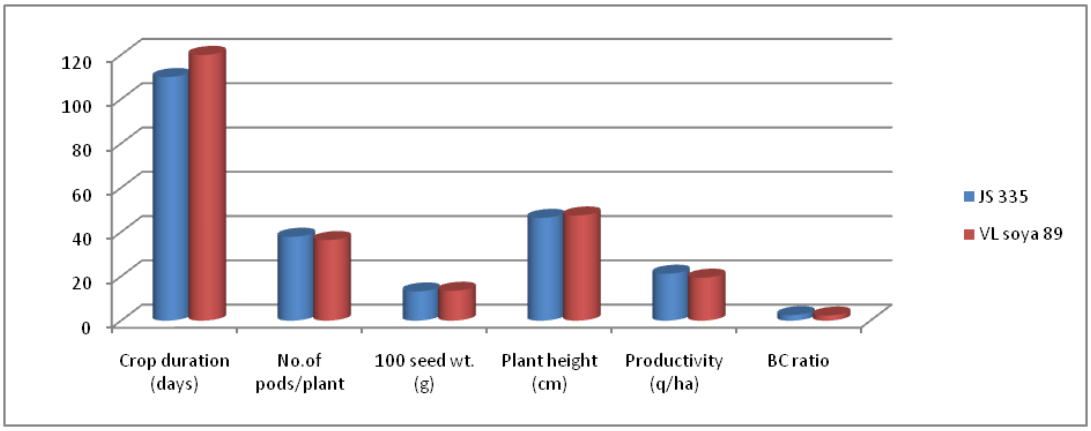


Fig.4 : Performance of JS 335 and VL Soya 89

Conclusion

JS 335 is known for possessing wide adaptability, good germinability, semi dwarf habit, non-lodging, non-shattering characteristics. We had seen positive result from the trial that JS 335 variety is one of the best adapted improved variety for Lawngtlai area and other part of Mizoram that can be used for large scale production. The overall performance was satisfactory and the difference in productivity may be due to the soil fertility condition of different upland areas. This variety can be grown for kharif and Rabi crop production to replace local long duration variety. Short duration during kharif season can sometime become disadvantage as harvesting and post-harvest management during rainy season is not easy.

Action Photos

Performance of Chickpea *var. Shubhra*

Introduction

Chickpea is one of the world's most important cool season food crops mostly grown in dry lands. It is grown extensively in India approximately 75% of world's chickpea production and this crop takes duration of about 4-5 months and can be grown on moderately heavy soils, black cotton soils and sandy loam soil. It is consumed in the form of processed whole seed or dal as well as a variety of snacks, sweets and condiments. It is a good source of protein, Carbohydrates, fats, minerals and vitamins. In India, it is grown throughout the country excepting high altitudes. Chickpea variety Shubhra (IPCK 2002-29) was released by IIPR, Kanpur in 2009. The potential yield is 20-22 q/ha. It is suitable for irrigated and timely sown condition. It is erect with light green foliage and creamy white seed colour with large seed size moderately resistant to wilt.

Technology Details (IIPR Kanpur, 2009)

Variety – Shubhra (IPCK 2002-29), NPK – 20:60:40 kg/ha, Spacing – 30cmx6cm, Carbendazim, Chlorpyriphos, Seed rate – 70-100 kg/ha, Date of sowing – 21.8.19 and 20.9.19, Date of harvest – 23.12.19 and 22.01.20

Result and Discussion

Shubhra variety of chickpea was cultivated on two different dates. The productivity was 17.6q/ha when it was cultivated in the month of September comparing to 12.5 q/ha only in August which may be due to different climatic and soil condition of the region. It has a deep tap root system. It produced profuse flowers and the average number of pods per plant was 33.2 and 45.6 when it was sown in August and September. The crop duration was 120 days. Average plant height was shorter when it was sown in the month of September by 2.1 cm. Some pest problem appeared but negligibly small.

Table 5: Effect of dates of sowing of Chick Pea in different parameters

Parameters recorded	Result (2 years)	
	August	September
Crop duration (days)	120	120
No. of pods/plant	33.2	45.6
100 seed wt.	33.3	33.5
Plant height (cm)	57.3	55.2
Productivity (q/ha)	12.5	17.6
BC ratio	2.4	3.4

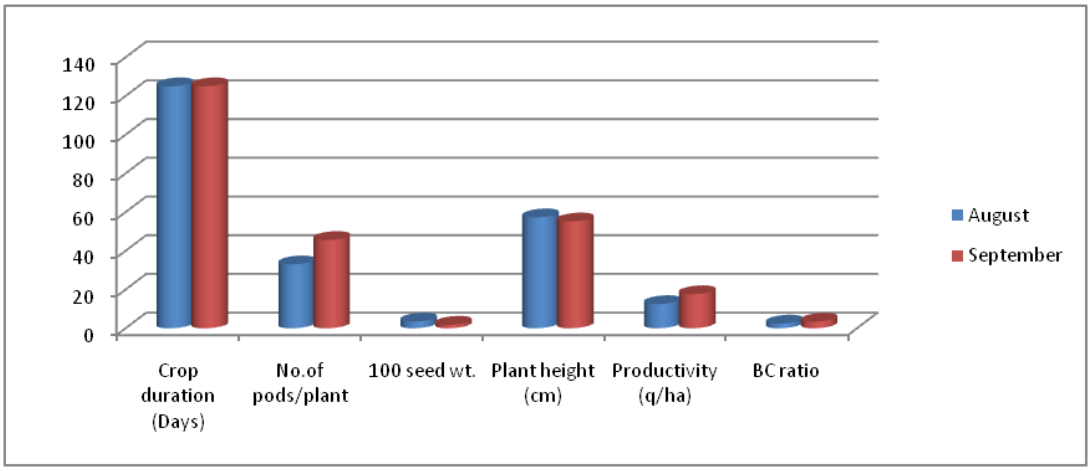
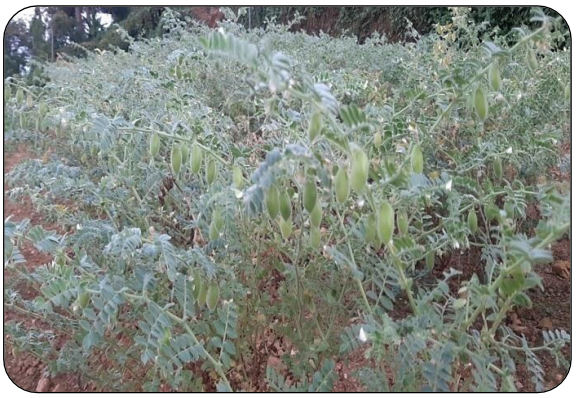


Fig. 5 : Performance on effect of dates of sowing of Chick Pea

Conclusion

The performance of chickpea indicated that chickpea can be grown under Lawngtlai district and depending upon the time of cultivation and soil fertility there was difference in the potential yield and yield attributes. Chickpea is not traditionally grown crop in Mizoram. Therefore, awareness campaign for popularization of Chickpea cultivation and provision of seed is required. There is good scope for marketing and if cultivation is popularized there will be better opportunity for upliftment of farmer's economic condition in Mizoram.

Action Photos



Performance of Rajmash *var. Arun*

Introduction

Rajma bean (*Phaseolus vulgaris* L.), often known as kidney bean or French bean is a major legume crop grown extensively in India. In hilly region it is grown during kharif and in lower hill sown as spring crop. In NE plain it is cultivated during Rabi. Rajmash require a warm and humid environment to grow and thrive. Arun (IPR 98-3-1) variety of Rajmash was released in 2007 by IIPR, Kanpur. The potential yield is 24-25 q/ha and crop duration is 120-125 days. It is tolerant to BCMV and seed is attractive dark red medium. Rajmash cultivation is not common in Mizoram and popularization is needed among the farmers.

Technology Details

Variety – Arun (IPR 98-3-1), NPK – 90:60:40 kg/ha, Spacing – 45cmx10cm, Carbendazim, Chlorpyriphos, Seed rate – 70-80 kg/ha, sowing time – 23.08.2019, harvesting time – 31.01.2020

Result and Discussion

Unlike other Rabi pulse, Rajmash required more Nitrogen due to poor nodulation. It is most irrigation responsive crop due to its shallow root system and high nutrient requirements. The Productivity of Arun variety was 15.5q/ha which is lower than its potential yield that may be due to climatic and soil fertility difference of the hill region. Growth and development of Arun variety was very good that indicated the adaptability to the climatic condition of the region. There was no much difference in height, 100 seed weight, plant population per square meter, pod length and number of seeds per pod. No serious pests and diseases were seen during cultivation.

Table 6 : Results on comparison between Arun & Canadian Red (Rajmah)

Parameters recorded	Results	
	Arun	Canadian Red
Crop duration (days)	125	125
No. of pods/plant	21.5	20.3
100 seed wt.	60	60
Plant height (cm)	43.5	43.5
Productivity (q/ha)	15.5	13.6
BC ratio	2.3	2.0

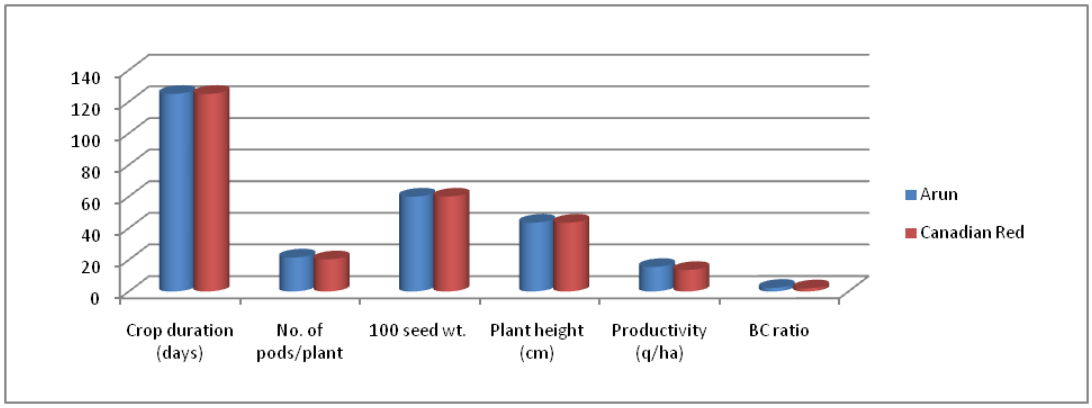


Fig. 6: Performance of Arun & Canadian Red

Conclusion

Rajmash beans are in high demand both home and international markets and cultivation can be a successful investment for farmers due to the high market potential. The crop performance of Rajmash (Arun) was good in all the results and therefore it is very much recommendable for the farmers to cultivate in Mizoram. Popularization of the crop among the farmers as well as provision of improved seed is required. It is generally cultivated for dry seed production during Rabi season that required irrigation for higher production.

Action Photos

Performance of Rapeseed *var. TS-67*

Introduction

Rapeseed and mustard are one of the most important oilseeds crops of India belonging to Brassicaceaea family. India ranked second in rapeseed/mustard production. Toria requires a cool temperature, fine seed bed with adequate moisture for satisfactory growth and production. TS 67 variety was released by AAU, Jorhat in 2015. Rapeseed variety TS-67 could be sown up to 2nd week of December without any significant decrease in yield and hence could be best fitted in Rice-Toria cropping sequence. Cultivation of these varieties may help the farmers of the North East India not only to increase the yield but also to mitigate problems like low oil content of local varieties, suitability in late sown condition etc. This is a short duration variety taking 90-95 days for harvesting with higher yield potential of 10-12 q/ha with oil content of 41-44 %.

Technology Details

Variety – TS 67, NPK – 50:60:30 kg/ha, Spacing – 30cmx5cm, Thiram and Chlorpyriphos, Seed rate – 4-5 kg/ha, Sowing time – October, Harvesting time –January

Result and Discussion

The number of seeds/siliqua was recorded highest in rapeseed variety TS-67 (15.33) as against rapeseed variety TS-36 (13). It leads to increase in production of crops. The rapeseed variety TS-67 having more of siliqua/plant as compared to TS-36 i.e 102.5 and 87.4. The rapeseed variety TS-36 grown as local variety and recorded as less yield compared to TS-67 variety. The average yield in TS-67 was 9.25 q/ha compared to TS-36 which was 6.7 q/ha. This is due to yield attributing characters of TS-67 variety. TS-67 recorded 114 cm in plant height as compared to TS-36 which was 85.6 cm at harvesting stage.

Table.7: Different parameters recorded on performance of TS 67 & TS 36

Parameters recorded	Result	
	TS 67	TS 36
Crop duration (days)	98	95
No. of seed/siliqua	15.3	13
No. of siliqua /plant	102.5	87.4
Plant height (cm)	114	85.6
Productivity (q/ha)	9.25	6.7
BC ratio	2.07	1.5

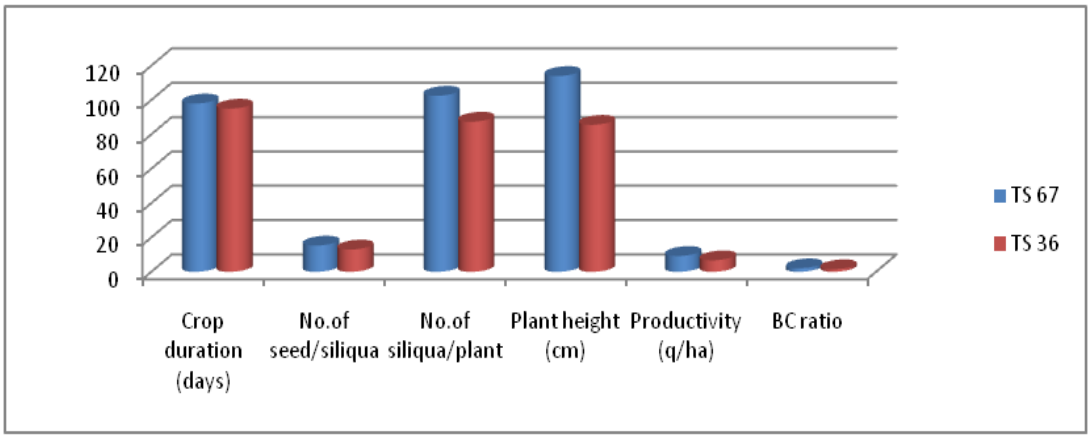


Fig. 7: Performance of Toria var. TS 67 and TS 36

Conclusion

Cultivation of Toria can improve farmers income by utilizing fallow land during Rabi season without affecting normal cropping season and this need to be popularized in Mizoram. The low yield of oilseed crop - Mustard and Toria grown widely in NE India including Mizoram is a result of multiple problems and mostly due to use of low yielding local varieties, rainfed cultivation and delayed sowing. Use of high yielding varieties with special characteristics will help to increase the yield of the crop. Hence, Toria varieties TS-67 and other mustard varieties which are short duration should be promoted.

Action photo

Performance of Sunflower during kharif season

Introduction

Sunflower is one of the four most important annual crops grown for oil in the world. It is an important addition to the list of edible oilseed crops in India in the last four decades. The primary use of sunflower is for human consumption. Sunflower produces healthful oil with a great consumer acceptance because of its high content of monounsaturated and polyunsaturated fatty acids as well as high Vitamin E content. COH 3 is a hybrid variety of Sunflower released in 2018 by AICRP (Sunflower) centre, Tamil Nadu Agricultural University. Its potential productivity under irrigated condition is 2410 kg/ha. The Trial was conducted by KVK Lawngtlai District at Chawnhu village during kharif season from June to September, 2023.

Technology Details (AICRP, TNAU- 2018)

Variety – COH 3, NPK – 60:60:30 kg/ha, FYM 7 ton/ha, spacing – 60cm x 30 cm, Captan/Thiram 3g/kg seed for seed treatment, Pendimethalin 3-5 g/l and Dichlorvos, seed rate – 5-6 kg/ha, sowing time – June, Harvesting time –September.

Result and Discussion

The crop duration of Sunflower variety COH 3 was 91 days. The head Diameter was 15.7 cm with 100 seed weight of 4.9g which is less than its potential record. The oil content was 35.6 % which is 42% in its potential record. The productivity of COH 3 during kharif season was 856.2 kg/ha which is very less than its potential record 2410 kg/ha under irrigated condition which may be due to heavy rain water that disturbed pollination.

Table 8 : Different parameters reading of Trial test on COH 3 & its Potential record

Parameters recorded	Result(2 years)	
	COH 3 (Demonstrated)	COH 3 (Potential record)
Crop duration (days)	91	92
Head diameter (cm)	15.7	18
100 seed weight	4.9	5.2
Oil content (%)	35.6 %	42%
Plant height (cm)	150.2	160
Productivity (kg/ha)	856.2	2410
BC ratio	1.2	3.6

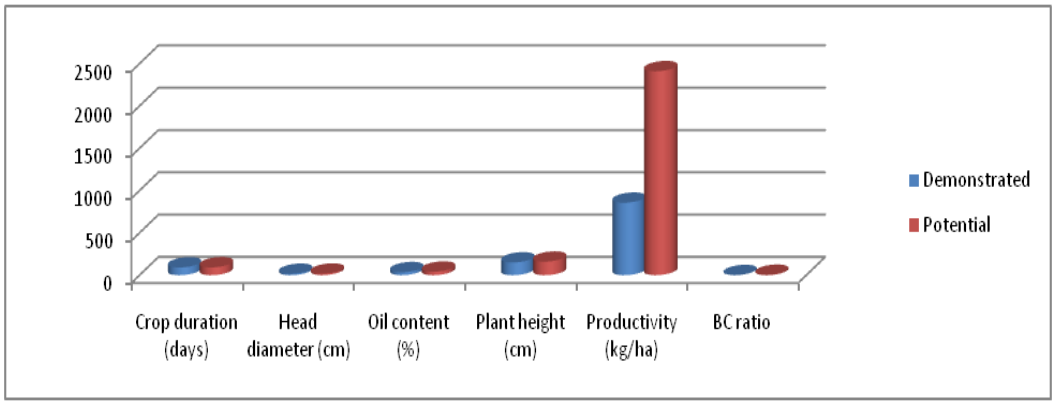


Fig. 8: Performance of Sunflower var. COH3 and its potential record

Conclusion

The demonstrated COH 3 was cultivated during kharif seson to avoid irrigation problem. The reading of COH 3 during kharif season was generally less than its potential reading which may be due to heavy rainfall during pollination that produced many unfertile seed. The BC ratio is 1.2 only which is because of less productivity during Kharif season. Sunflower COH 3 can be cultivated during kharif season but the production during kharif season is less than its potential yield. Producing sunflower seed without giving much effort during kharif season is still very good for the farmers to increase their income. Harvesting during rainy season was not an easy job because sun drying of seed is an urgent need for sunflower seed if not seed easily germinated and post-harvest management become a big issue during rainy season.

Action photos

Performance of HQPM 5 and RCM 76 (Maize)

Introduction

Maize (*Zea mays L.*) is one of the most versatile crops having wide adaptability under different agro climatic conditions. It is the third most important cereal crops of India and the second most important crop of Mizoram. Its importance lies in the fact that it is not only used for human consumption and animal feed but widely used for production of other important products. Quality Protein Maize 5 (HQPM 5) was developed by CCSHAU, Uchani, Karnal and released in 2007. HQPM-5 is early maturing and having yield potential of 6 ton/ha. It is orange and flint Maize. RCM 76 variety also developed by ICAR for NE region. It has yield potential of 5-5.5 ton/ha. It is also very important maize variety for food and animal feed production. Both the varieties can be grown throughout the year. The research was conducted at farmer's field by KVK Lawngtlai for obtaining their performance in the climatic condition of the district.

Technology Details

Variety – HQPM 5 and RCM 76, NPK – 80:60:40 kg/ha, spacing – 60cm x 30cm, Captan/Thiram 2g/kg seed for seed treatment, Atrazine for weed control. Dichlorvos for insect control, seed rate – 20 kg/ha, sowing time – June, crop duration – 90 days and 100 days, Harvesting time –September.

Result and Discussion

Growth behaviour of the crop plant was reflected by the final height of the plants at maturity and influenced by their varieties. RCM 76 was higher than HQPM 5 by 16.5 cm. Crop duration of HQPM 5 is shorter (by 10 days) but the yield of HQPM 5 was found lower than RCM 76. Productivity of RCM 76 was more than HQPM 5 (by 2.7 qtls.) and stover production of RCM 76 was also higher by 10.2 quintals. The superiority of RCM 76 over HQPM 5 may be due to better adaptability to the climatic and soil condition of Lawngtlai district.

Table 9. Different parameters recorded on RCM 76 and HQPM 5

Parameters recorded	Result (2 years)	
	RCM 76	HQPM 5
Crop duration (days)	100	90
100 seed wt.(g)	24	26.2
Stover yield (q/h)	98.7	88.5
Plant height (cm)	236.3	219.8
Productivity (q/ha)	40.2	37.5
BC ratio	2.2	2.0

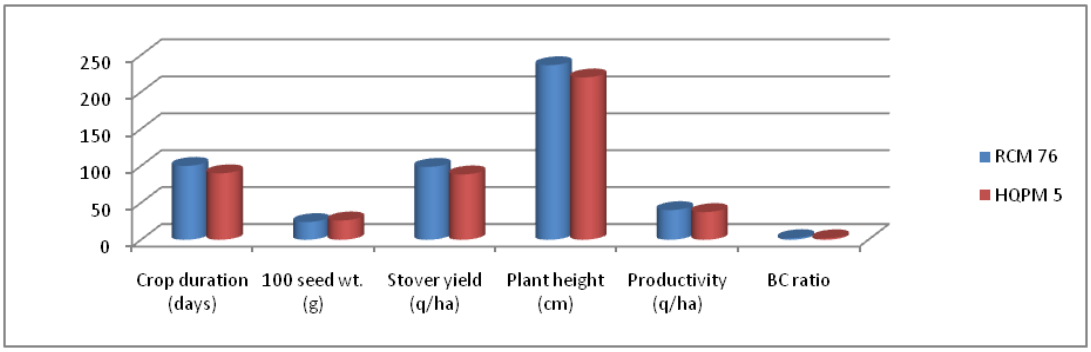


Fig.9: Performance of Maize var. RCM 76 and HQPM 5

Conclusion

It is very clear from the table that HQPM 5 and RCM 76 varieties of maize are performing well under Lawngtlai District climatic condition. Although the productivity of both varieties are less than their potential yield but it is by far higher than the national productivity of maize which may be due to difference in climatic and soil condition of the region. QPM is described as nutritionally superior maize with high lysine and tryptophan contents and desired kernel characteristics as compared to its normal maize counterparts. RCM-76 is a maize cultivar that is suitable for growing in the hills of the North East Region. By Popularisation of both the varieties among the farming community of Mizoram maize production can be increased.

Action photos

Sequential cropping of Maize - Soyabean

Introduction

Sequential cropping is a form of multiple cropping where crops are grown in sequence on the same field. It has several benefits like restoring and enhancement of soil quality. It can also be an effective and inexpensive way to manage plant diseases and can help prevent soil erosion. Only one crop is planted at a time, so competition for soil is not an issue. The impact of one crop on another changes how water and nutrients are managed. The preceding crop has a considerable influence on the succeeding crop. This technology can play a crucial role in Mizoram by increasing cropping intensity and restoring soil fertility of land. The research was conducted in the farmer's field under Lawngtlai area and maize variety - RCM 76 and soybean variety - JS 335 were used because these varieties were tested in the area successfully.

Technology Details (ICAR Manipur, 2015)

Variety – HQPM 5 and JS 335, NPK – for 80:60:40 and 20:60:40 kg/ha, spacing – 60 cm x 30 cm and 45cmx30cm, Thiram 2g/kg seed for seed treatment, Atrazine for weed control. sowing time – June and September, crop duration – 100-110 days, harvesting time September and December.

Result and Discussion

Sowing of maize was done in the first week of June, 2022. RCM 76 variety was harvested after 100 days, 100 seed weight was 24 gram. The productivity was 40.2 q/ha with 235.7 cm in height and stover yield was 97.5 q/ha having BC ratio 2.0. The Seed of JS 335 variety of soybean was sown just after harvest of maize. The duration of JS 335 was 110 days having productivity 18.2 q/ha. and height was 46.4 cm. the stover yield was 25.3 q/ha and 100 seed weight was 13.2 g. Soybean is leguminous crop and they have the ability to fix atmospheric nitrogen for their own uses. The performance of both the crops were good may be due to separate cultivation in the same land without disturbing between themselves for water and nutrients.

Table 10: Different parameters reading of Sequential cropping

Name of crop	Yield (Qlt/ha)		% increase in yield over local	Gross Cost (Rs/ha)	Gross Return (Rs/ha)	Net Return (Rs/ha)	BC Ratio
	Demo	Local					
Maize (HQPM 5)	25.5	21.0	21.42	52,550	1,67,100	1,14,550	3.18
Soybean (JS 335)	18.5	-	100				

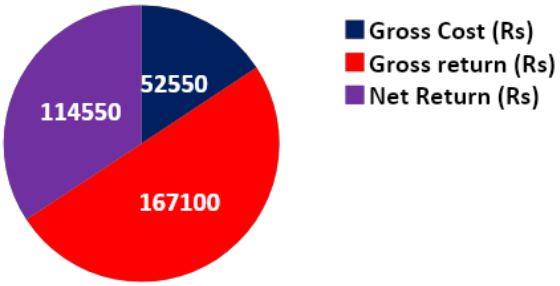


Fig.10: Economics analysis of Sequential cropping of Maize-soybean

Conclusion

A simple form of multi-cropping is sequential cropping, which involves growing a second crop after harvesting the first crop. The result showed that good production of Maize variety RCM 76 that was followed by soybean variety JS 335 which can also restored soil fertility along with good yield, increased cropping intensity (200%) and farmers' income. From the study it can be concluded that there is very good scope for the farmers of Mizoram to adopt sequential cropping technology which give an overall maximum productivity and profit for the farmers.

Action Photos

Performance of Brinjal var. *Arka Kusumakar*

Introduction

Brinjal var. *Arka Kusumakar* is a tall spreading plant with green stem and green leaves. The flowers are white in colour, fruits are green small and borne in cluster. It has a soft texture with good cooking quality.

Technology Detail (IIHR, Bangalore (1999)

Variety: *Arka Kusumakar*
Sowing time: March-April
Transplanting: May
Seed rate: 200-250 g/ha
Soil treatment: Soil in pit is treated with Chlorpyriphos and Carbendazim before sowing
Planting distance: Pit is prepared at a spacing of 60 x 45 cm.
Manures & Fertilizers: NPK - 120:80:50 kg/ha
Harvesting: August

Results & Discussion

A plant height of 82 cm and 50 cm was observed in *Arka Kusumakar* and Local variety, respectively. The fruit length recorded in *Arka Kusumakar* (16.8cm) was comparatively higher than the local variety (8.5 cm). The fruit weight of 100 g was found in *Arka Kusumakar* whereas 80 g in local variety. The fruit yield obtained in *Arka Kusumakar* and Local variety was 22 t/ha and 10.5 t/ha, respectively. Crop duration of 140 days was observed in *Arka Kusumakar* which was lower than the local variety i.e., 150 days after sowing.

Table 11: Performance of Arka Kusumakar and Local Variety

Parameters	Result (2 years)	
	Arka Kusumakar	Local (Non-descript)
Plant Height (cm)	82	50
Fruit Length (cm)	16.8	8.5
Fruit Weight (g)	100	80
Yield (t/ha)	22	10.5
Crop Duration (Days)	140	150

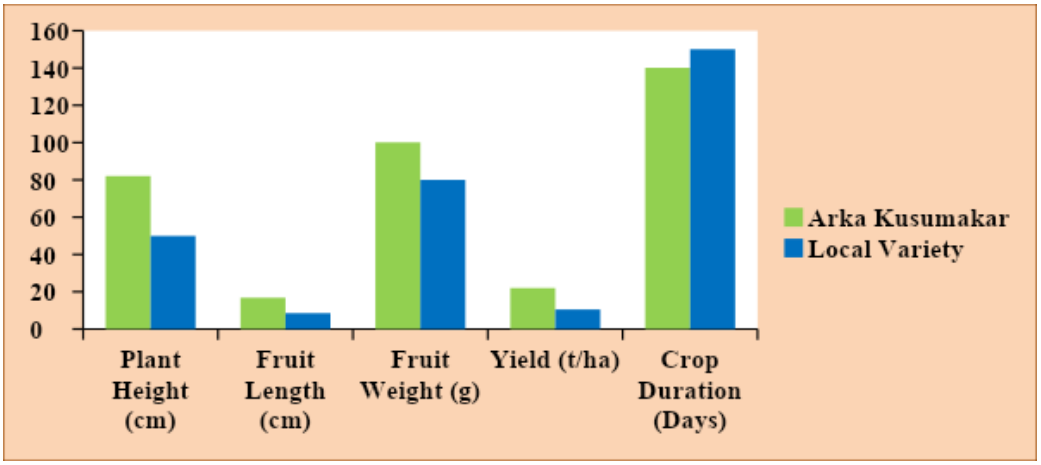


Fig. 11: Performance of Arka Kusumakar and Local Variety

Conclusion

Apart from higher and improved yield in comparison to local variety, *Arka Kusumakar* has a good cooking quality which convinced the farmers to take up *Arka Kusumakar* in large scale.

Action photos

Off Season Cultivation of Tomato var. *Arka abhed*

Introduction

Tomato variety *Arka abhed* is a high yielding F_1 hybrid with multiple disease resistance to Tomato Leaf Curl Disease, Bacterial Wilt, Early Blight and Late Blight. It is suitable for summer, kharif and rabi cultivation. Unlike other part of the country, Mizoram receives a high rainfall during monsoon which leads to higher incidence of foliar and fruit rot diseases in tomato. As such, these diseases incidence resulted in low crop productivity and affects the farmers' income during off-season. Therefore, KVK Lawngtlai District is taking up cultivation of multiple disease resistant tomato variety *Arka abhed* during off-season as on-farm trial to help the farmers increase tomato production with higher rates.

Technology Detail (IIHR, Bangalore (2016)

Variety: *Arka abhed*
Sowing time: May
Seed rate: 100g/ha
Nursery bed preparation: Soil in Nursery is treated with Chlorpyriphos and Carbendazim before sowing
Planting distance: Plant to plant - 45 cm, Row to row - 60 cm
Staking: Bamboo staking/ trailing with GI wire/ plastic rope
Manures & Fertilizers: NPK - 75:60:60 kg/ha
Harvesting: September

Results & Discussion

The number of fruits per plant recorded in *Arka abhed* was 51 Nos. whereas 49 Nos. in *Arka Rakshak*. The fruit weight was found to be 96.5 g and 93.1 g in *Arka Abhed* and *Arka Rakshak*, respectively. The fruit yield of *Arka abhed* (142 q/ha) was comparatively higher than *Arka Rakshak* (136 q/ha). The crop duration of 120 and 135 days were observed in *Arka Abhed* and *Arka Rakshak*, respectively

Table 12: Growth and Yield Performance of Arka Abhed and Arka Rakshak

Arka Abhed	*2 years result*	
	Parameters	***Arka Rakshak***
51	No. of Fruits/plant	49
96.5	Fruit Weight (g)	93.1
110	Plant Height (cm)	123
142	Yield (q/ha)	136
120	Crop Duration (Days)	135
6.8:1	BC Ratio	3.6:1

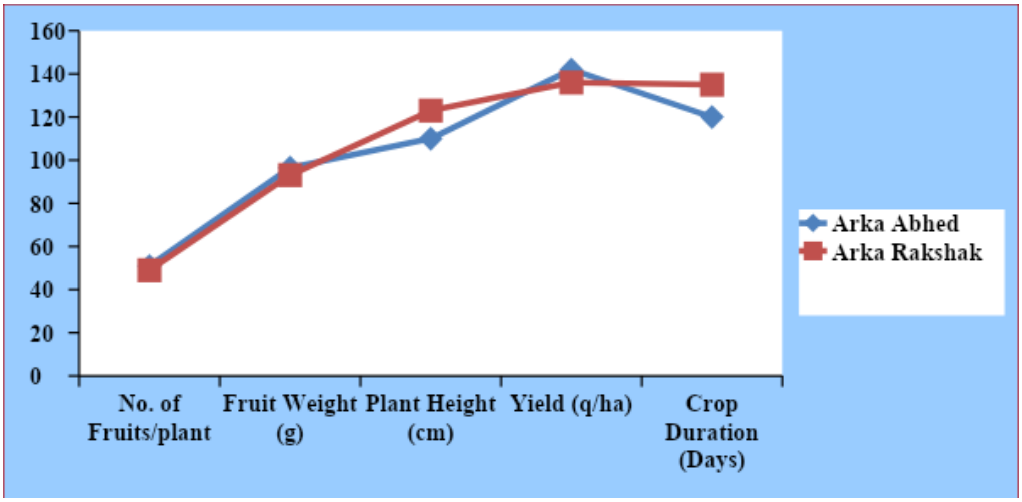


Fig. 12: Growth & Yield Performance of Arka Abhed & Arka Rakshak during Off-Season

Conclusion

Among the two varieties studied, *Arka Abhed* was found to obtain superior quality attributes, thereby making it suitable for cultivation during off-season.

Action photos

Performance of Musk Melon var. *Arka Siri*

Introduction

Musk melon variety *Arka Siri* has a Tuscan cantaloupe background with an elongated globe shaped fruit weighing 1.2 kg. It has a nice aroma and relatively tolerant to diseases like powdery and downy mildew. Musk melon variety cultivated in Mizoram is big and size and farmers face problems in handling and marketing. Thus, keeping in view the problems of the farmers, KVK Lawngtlai District is taking up on-farm trial on assessment of performance of musk melon variety *Arka Siri* which is medium in size and attractive in appearance and aroma.

Technology Detail (IIHR, Bangalore (2019)

Variety: *Arka Siri*
Sowing time: November (Rabi)/ February (Kharif)
Seed rate: 3 kg/ha
Soil treatment: Soil in pit is treated with Chlorpyriphos and Carbendazim before sowing
Planting distance: 1.5 m plant to plant and 30 cm row to row/ raised bed
Manures & Fertilizers: NPK – 40:60:30 kg/ha
Harvesting: February (Rabi)/ May (Kharif)

Results & Discussion

The fruit yield (21 t/ha) of *Arka Siri* is found to be higher than the local fruit yield (18 t/ha), thereby resulting in higher BC ratio, *i.e.,* 5.6:1 (*Arka Siri*) than 3.15:1 (Local).

Table 13: Performance of Arka Siri and Local Variety

Parameters	Result(2 Years)	
	Arka Siri	Local (Non-descript)
Fruit Length (cm)	19.75	39.6
Fruit Diameter (cm)	19.62	25.4
Fruit Weight (kg)	1.02	3.7
Yield (t/ha)	21	18
BC Ratio	5.6:1	3.15:1

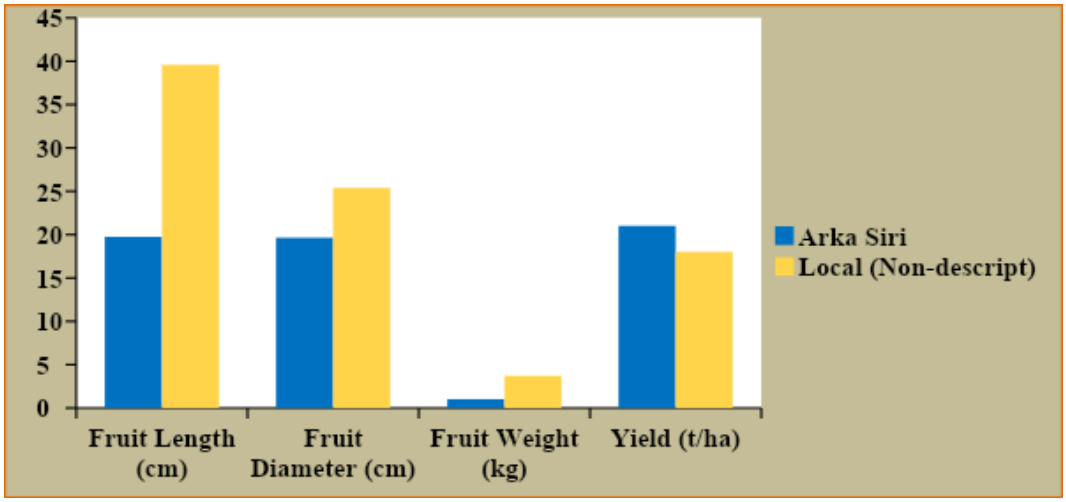
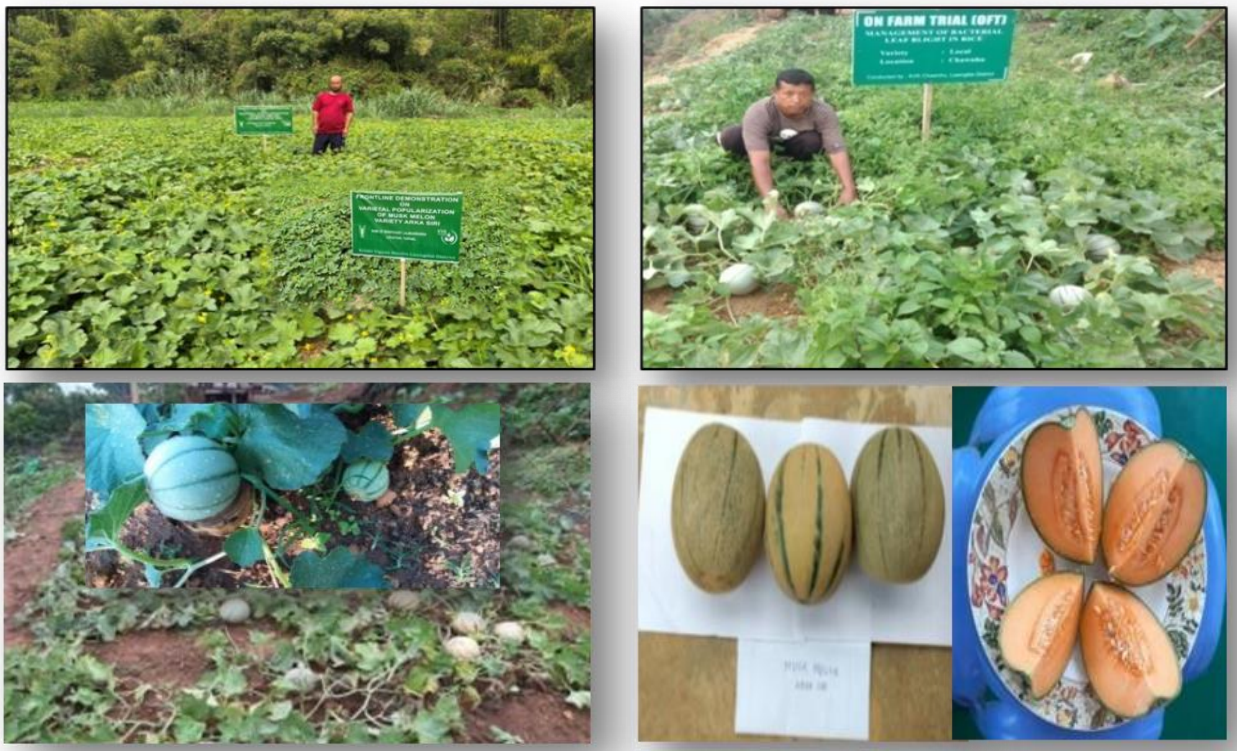


Fig.13: Performance of Arka Siri and Local variety

Conclusion

Musk melon variety *Arka Siri* has gained attraction due to its medium size, musky aroma and appealing pattern of netting, plus green sutures on creamish orange rind. Therefore, it is widely accepted by the farmers for large scale adoption.

Action photos



Performance of Okra var. *Arka Anamika*

Introduction

Okra var. *Arka Anamika* is a tall and well branched plant. It has a medium sized, green, tender and long fruit, free from spine with 5-6 ridges and delicate aroma. Fruits are borne in two flushes. Purple pigment is present on both sides of the petal base. The plant has a green stem with purple shade. It has a good keeping and cooking qualities and is resistant to Yellow Vein Mosaic Virus. The productivity of okra in Mizoram is greatly affected by incidence of yellow vein mosaic virus, so on-farm trial on assessment of YVMV resistant okra variety *Arka Anamika* was taken up by KVK Lawngtlai District.

Technology Detail (IIHR, Bangalore (1995)

Variety: *Arka Anamika*
Sowing time: April-June
Seed rate: 8-10 kg/ha
Soil treatment: Soil in pit is treated with Chlorpyriphos and Carbendazim before sowing
Planting distance: Pit is prepared at a spacing of 60 x 30 cm. For pit sowing 3-4 seeds per pit is preferred.
Manures & Fertilizers: NPK - 100:50:50 kg/ha
Harvesting: June (April sown crops)/ August (June sown crops)

Results & Discussion

The plant height recorded in *Arka Anamika* and Local variety was 95 cm and 75 cm, respectively. The fruit length of *Arka Anamika* (18 cm) was higher than the local variety (13 cm). The fruit yield of 14 t/ha was recorded in *Arka Anamika* whereas 6 t/ha in local variety. Crop duration of 55 days was observed in *Arka Anamika* which was comparatively lower than to the local crop i.e., 65 days after sowing.

Table14: Performance of Arka Anamika and Local Variety

Parameters	Result(2 years)	
	Arka Anamika	Local (Non-descript)
Plant Height (cm)	95	75
Fruit Length (cm)	18	13
No. of Fruits/plant	14	10
Yield (t/ha)	10	6
Crop Duration (Days)	55	65
BC Ratio	2.9:1	1.6:1

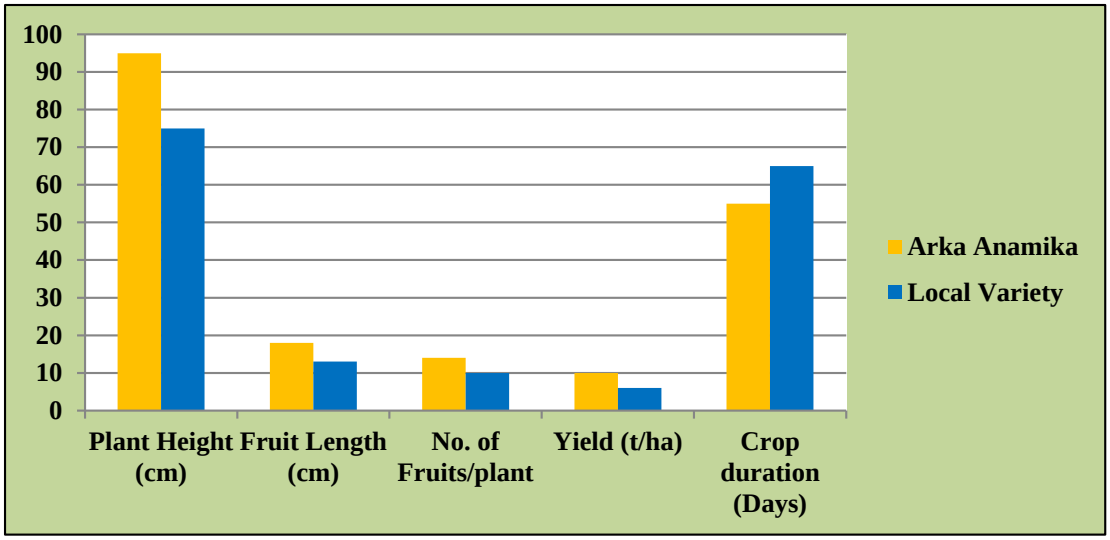


Fig: 14. Performance of Arka Anamika and Local Variety

Conclusion

Due to its resistance to yellow vein mosaic virus and high productivity within a short period of time, farmers are ready to adopt *Arka Anamika* for large scale adoption.

Action photos

Varietal Performance of Onion var. *Arka Kirthiman*

Introduction

Onion var. *Arka Kirthiman* is a medium size red coloured bulb with globe shape and firm texture. It is tolerant to purple blotch, basal rot and thrips with 4-5 months post harvest life. It is suitable for both Kharif and Rabi seasons. Farmers are facing problems in marketing of the existing onion variety *Matahari* due to its big size, so KVK Lawngtlai is taking up on-farm trial on assessment of Onion variety *Arka Kirthiman* to help the farmers increase in crop productivity and their income.

Technology Detail (IIHR, Bangalore (2019)

Variety: *Arka Kirthiman*
Sowing time: September-October
Transplanting: November-December
Seed rate: 8-10 Kg/ha
Soil treatment: Soil is treated with Chlorpyriphos and Carbendazim before sowing
Planting distance: 15 (row to row) x 10 cm (plant to plant)
Manures & Fertilizers: NPK - 125:75:125 kg/ha
Harvesting: January-February

Results & Discussion

A plant height of 85 cm and 97.3 cm was observed in *Arka Kirthiman* and *Matahari,* respectively. The bulb weight of 118 g was found in *Arka Kirthiman* whereas145 g in *Matahari.* The yield obtained in *Arka Kirthiman* (12.3 t/ha) was higher than *Matahari* (10.1 t/ha). Crop duration of 125 days was observed in *Arka Kirthiman* which was lower than the *Matahari i.e.,* 140 days after sowing.

Table 15: Performance of Arka Kirthiman and Matahari

Parameters	*Result (2 years)*	
	Arka Kirthiman	*Matahari*
Plant Height (cm)	85	97.3
Bulb Weight (g)	118	145
Bulb Length (cm)	5.7	6.2
Bulb Diameter (cm)	9.2	13.4
Yield (t/ha)	12.3	10.1
Crop Duration (Days)	125	140
BC Ratio	4:1	3.2:1

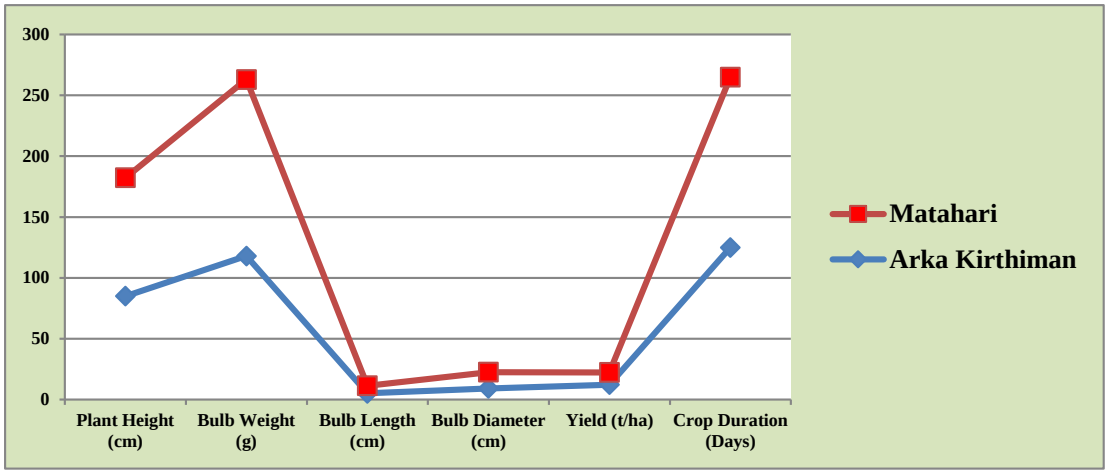


Fig. 15: Performance of Arka Kithiman and Matahari

Conclusion

The existing onion variety cultivated (*Matahari*) is a large size bulb which resulted in poor marketing. Thus, paving way for the Onion var. *Arka Kirthiman* for large scale adoption.

Action photos

Varietal Performance of Radish var. *Arka Nishant*

Introduction

Radish var. *Arka Nishant* is a long root, marble white coloured flesh with crispy texture and mild pungency. It is resistant to pithiness, root branching, forking and pre-mature bolting.

Technology Detail (IIHR, Bangalore (1995)

Variety : *Arka Nishant*
Sowing time : October
Seed rate : 10 kg/ha
Soil preparation: Soil is treated with Chlorpyriphos and Carbendazim before sowing
Ridge height : 1 ft
Planting distance: Plant to plant - 8 cm
Row to row - 30 cm
Manures & Fertilizers: NPK - 50:100:50 kg/ha
Harvesting : December

Results & Discussion

The plant height recorded was 20 cm and 15 cm in *Arka Nishant* and Local (Non-descript), respectively. *Arka Nishant* was found to obtain higher root length (32 cm) than local variety (27 cm). The root weight of *Arka Nishant* (185 q/ha) was comparatively higher than local variety (116 q/ha). The crop duration of *Arka Nishant* (45 days) was comparatively shorter than the local variety (60 days).

Table 16: Performance of Arka Nishant and Local (Non- descript)

Parameters	Result (2 years)	
	Arka Nishant	Local (Non-descript)
Plant Height (cm)	20	15
Root Length (cm)	32	27
Root Weight (g)	350	280
Yield (q/ha)	185	116
Crop Duration (Days)	45	60
BC Ratio	5.4:1	2.88:1

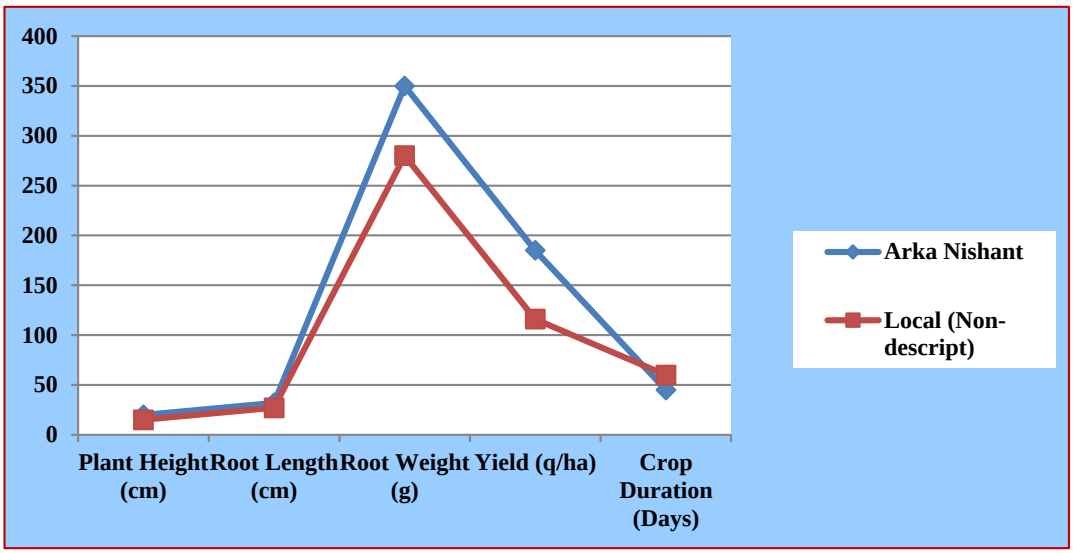


Fig.16: Performance of Arka Nishant and Local (Non-descript) variety

Conclusion

Being a high yielding variety with higher benefit cost ratio within a short period, *Arka Nishant* was found to have gained farmers attraction making it suitable for large scale adoption.

Action photos

Popularization of French Bean var. *Zorin Bean*

Introduction

Zorin Bean is a purple coloured high yielding climbing French bean. It can be cultivated both in Kharif and Rabi seasons. The pods are rich in flavonoids and antioxidant content. The tender pods are rich in anthocyanin pigment which has the potential to neutralize the free radicals in the body and thereby very effective against cancer, ageing, heart problem, inflammation and diabetes.

Technology Detail (State Seed Variety Release, Mizoram (2019)

Variety: Zorin Bean
Sowing time: October (Rabi)/ May (Kharif)
Seed rate: 25-30 kg/ha
Soil treatment: Soil in pit is treated with Chlorpyriphos and Carbendazim before sowing
Planting distance: Pit is prepared at a spacing of 45 x 60 cm. For pit sowing 3-4 seeds per pit is preferred.
Staking: Bamboo staking or trailing with iron strings
Manures & Fertilizers: NPK - 60:80:50 kg/ha
Harvesting: December (Rabi)/ July (Kharif)

Results & Discussion

The number of pods recorded in Zorin Bean was 112 Nos. whereas 108 Nos. in local bean. The pod yield (121 q/ha) of Zorin Bean was comparatively higher than the local pod yield (103 q/ha). The crop duration of Zorin Bean was also found to be 65 days after sowing which is shorter in duration compared to the local crop i.e., 90 days after sowing.

Table 17: Different parameters on cultivation of Zorin Bean and Local Bean

Parameters	Result	
	Zorin Bean	Local (Non-descript)
No. of pods per plant	112	108
Pod length (cm)	22	23.2
Fruit weight (g)	12.3	12.7
Pod yield (q/ha)	121	103
Crop Duration (Days)	65	90
BC Ratio	6.6:1	3.5:1

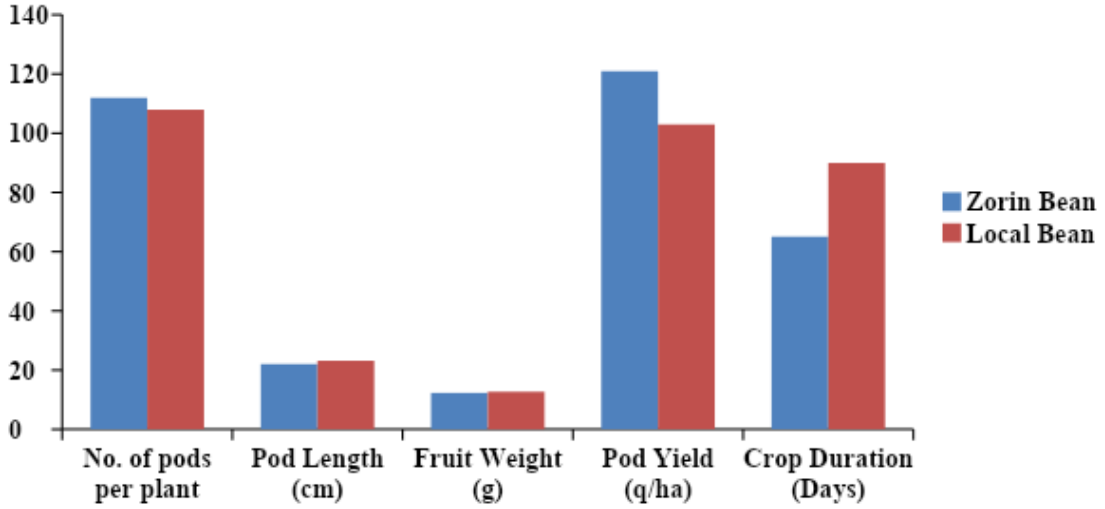


Fig. 17: Different parameters recorded on cultivation of Zorin Bean and Local Bean

Conclusion

Due to its unique colour and high productivity during a short period of time, Zorin bean's demand has increased, thereby improving the economic condition of the farmers.

Action photos

Popularization of Chilli var. *Arka Suphal*

Introduction

Chilli var. *Arka Suphal* is tall and spreading plant. Fruits are green, smooth, medium long with blunt tip, firm and pendant. The green colour shining fruit turns to deep red on maturity. It is pungent and tolerant to powdery mildew and viruses. It is suitable for both irrigated and rainfed cultivation. The crop productivity and cropping intensity is greatly affected by the leaf curl and anthracnose diseases in the Lawngtlai District. So, *Arka Suphal* variety was taken up as on-farm trial by KVK Lawngtlai District to assess its growth and yield performance in Lawngtlai District, Mizoram.

Technology Detail (IIHR, Bangalore (1990)

Variety: *Arka Suphal*
Seed rate: 1-1.25 kg/ha
Sowing time: April-May
Transplanting: June-July
Irrigation: One day before planting and light irrigation after transplanting
Soil treatment: Soil is treated with Chlorpyriphos and Carbendazim before sowing
Planting distance: 75 (row to row) x 75 cm (plant to plant)
Manures & Fertilizers: NPK - 100:50:50 kg/ha
Harvesting: August-September
Crop Duration: Green Chillies (100 days) / Dry Chillies (130 days)

Results & Discussion

Arka Suphal recorded a plant height of 80 cm whereas 48 cm in local variety. The fruit weight of 100 g and 80 g was observed in *Arka Suphal* and local variety, respectively. *Arka Suphal* and local variety obtained fruit length of 7.3 cm and 3.5 cm, respectively. Crop duration in *Arka Suphal* (100 days) was comparatively shorter than Mizo chilli (150 days). The yield recorded were 19.5 t/ha (*Arka Suphal*) and 11 t/ha (Local variety).

Table 18: Different parameters recorded on cultivation of Arka Suphal and Local (Mizo Chilli)

Parameters	*Arka Suphal*	Local (Mizo Chilli)
Plant Height (cm)	80	48
Fruit Weight (g)	100	80
Fruit Length (cm)	7.3	3.5
Yield (t/ha)	19.5	11
Crop Duration (Days)	100	150
BC Ratio	3.2:1	1.9:1

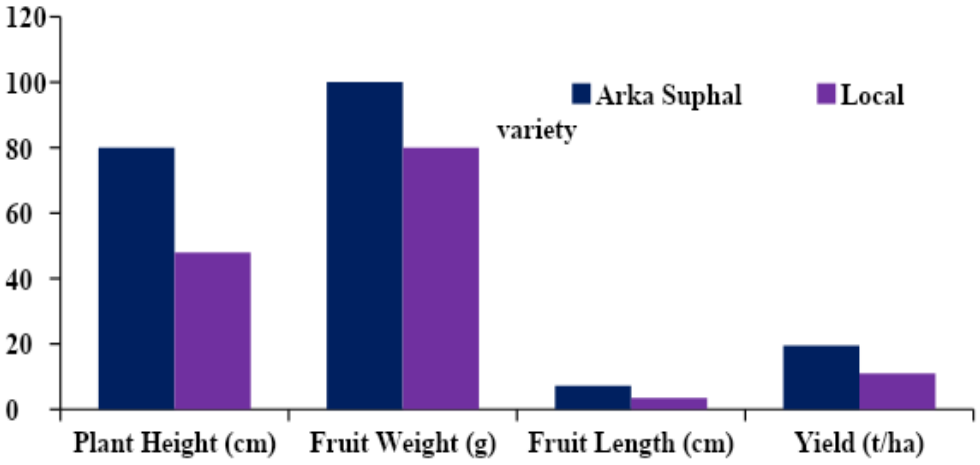


Fig .18: Performance of Arka Suphal and Local (Mizo Chilli) variety

Conclusion

Arka Suphal is widely accepted by the farmers due to its resistance to powdery mildew and viruses and improved yield compared to the existing variety. As such, all these improved performances resulted in increased productivity and cropping intensity.

Action photos

Round the Year Production of Vegetables under Low Cost Poly-House

Introduction

The demand for fresh vegetable prevails round the year but supply is restricted to seasonality and weather conditions. The productivity of vegetable crops are very low in Mizoram due to diverse climatic condition and number of factors like abiotic stresses (High rainfall during rainy season, moisture stresses during summer, poor in soil nutrient due to losses resulted by the process of leaching, toxicity of heavy metal ions) and biotic stresses (Bacterial wilt in tomato and capsicum, mildew in cucumber, etc.). To increase the availability of the fresh vegetables beyond normal season, promotion of off-season cultivation is the need of the hour. By adopting proper protection technologies and providing favourable environment, crops with desirable yield and quality can be raised during off season. They also have advantage for off season production to get higher prices.

The low cost poly-house of 100m^2 (5x20m) area is constructed by using transparent, UV stabilized and 200µ thickness polythene sheet, 50% shading net and the locally available materials like bamboo for framing and tied with the help of wire. The total estimated cost for 100m^2 (5x20m) area will be about Rs 25,000/-. The approximate cost for installation of in-line drip irrigation is estimated to be Rs 5000/-. There is no need of heating and cooling system.

Technology Details (ICAR, Umiam, Meghalaya (2016)

A. **Cultivars:** Tomato (*Arka Abhed*), Cucumber (*Anushka F_1*) and *Capsicum (Indra)*
B. Soil Preparation: Soil is treated with Chlorpyriphos and Carbendazim before sowing.
C. **Sowing time:** Tomato (Jun-Jul), Cucumber (Oct-Nov) and Capsicum (Jan-Feb)
D. **Transplanting:** The nursery is ready in 30 days for transplanting.
E. **Spacing:** Tomato & Capsicum (60 x 45 cm) and Cucumber (100 x 60 cm)
F. **Training & Pruning:** Tomato (20-30 days after transplanting), Cucumber (days after planting) and Capsicum (15-20 days after planting)
G. Fertilizer: NPK - 5:3:6, respectively as foliar application
H. **Harvesting:** Tomato (75-85 days after planting), Cucumber (45-50 days after sowing) and capsicum (150 days after planting).

Results & Discussion

The overall crop performances (plant height, fruit length & weight and number of fruits/plant) in poly-house were observed to be better than the open cultivated crops. Vegetables cultivated under low cost poly-house recorded higher yield i.e., 14.2 t/ha (Tomato), 9 t/ha (Cucumber) and 12 t/ha (Capsicum) than open cultivated (13.3 t/ha, 6.2 t/ha and 9.9 t/ha, respectively) thereby resulting in higher BC ratio.

Table 19: Performance of Vegetables under Protected and Open Cultivation

Parameters	Tomato		Cucumber		Capsicum	
	Protected	Open	Protected	Open	Protected	Open
Plant Height (cm)	123	110	213	182	95	76.2
Fruit Length (cm)	6.3	6.1	9.8	9.5	9.2	6.3
Fruit Weight (g)	96.5	93.1	496	450	170	120
No. of fruits/plant	51	47	13	11	23	16
Fruit yield (t/ha)	14.2	13.3	9	6.2	12	9.9
Crop Duration (Days)	120	135	45	50	145	150
BC ratio	6.6:1	3.6:1	5.2:1	3.3:1	6.5:1	4.6:1

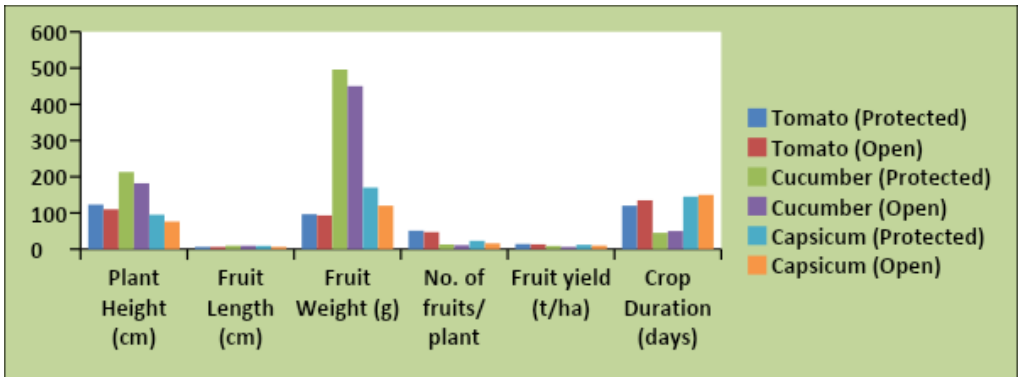


Fig. 19: Performance of Vegetables under Low Cost Poly-house & Open Condition

Conclusion:

Protected cultivation of tomato, cucumber and capsicum has improved crop productivity, cropping intensity which resulted in round the year food production. It is because of the success of off-season vegetables in poly-house throughout the year, more farmers are showing interest in cultivation of vegetables in low cost poly-house.

Action photos

Management of Rhizome rot of Ginger

Introduction

Ginger is one of the most important cash crops in Mizoram and mostly grown in Jhum cultivation. However, Rhizome rot is the most devastating disease of Ginger which caused up to 100% loss in Yield. So, Management of the disease is the utmost important for Farmers to reduce /prevent losses due to this dreadful disease. Field trial on Management of Rhizome rot incidence was carried out successfully in different villages of Lawngtlai District under IPM programme.

Technology (AAU Jorhat, 2015)

- Variety : *Thinglaidum* (Local)
- Select only healthy seed Rhizome for planting
- Seed treatment with Copper Oxychloride (3g/lt) + Streptocycline (0.2g/lt) for 45 minutes and kept under shade for 24 hours before sowing
- Soil drenching with Copper Oxychloride (3g/lt) at 60 DAS and 90 DAS

Result and Discussion

The treatments were found very effective in reduction of disease incidence as well as spread of inoculums to adjacent crops. Rhizome rot incidence was reduced by 80.76% over the control practice. In most of the parameters reading, the treatments were significant over the control except average no. of tillers and plant height. Increased marketable yield by 38.80 per cent over the check. Rhizome rot was mainly caused by Bacteria and Fungi. They are soil and Seed borne inoculums, therefore, selection of only healthy Seeds could prevent up to 90% disease infection and dissemination of inoculums under field Condition.

Table 20: Different parameters recorded on Management of Rhizome rot of Ginger

Parameter recorded	Result	
	Treatment	Check
Rhizome rot incidence (%)	5.30	26.0
Avg. Tiller /hill	10.54	9.40
Germination (%)	95.0	76.60
Avg. plant height (cm)	44.70	44.0
Yield (Qlt/ha)	122.40	88.20

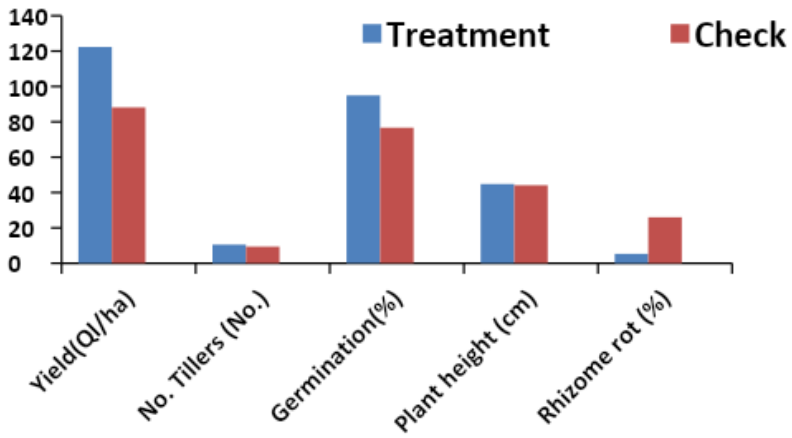


Fig. 20: Different parameters recorded on Management of Rhizome rot of Zinger

Conclusion

The technology was found satisfactory result in suppression or prevention of Rhizome rot incidence caused by Fungi and Bacteria. Use of Copper fungicides are to be safe for humans when used in small amounts or as per the doses and kills fungal diseases by denaturing proteins and enzymes in cells of pathogens they contact that have not yet infected the plants. They have no post-infection activity and are non-selective, which is why phyto-toxicity occurs when they get inside plants.

Action Photos

Management of Mango Stone Weevil

Introduction

Mango is one of the most important fruit crops of Lawngtlai District where Kawlchaw "W", Sihtlangpui and Chawntlangpui villages are the major growing areas of Mango ***(Rangkuai).*** Even though this Mango ***(Rangkuai)*** is very delicious, it is vulnerable to Pests particularly Mango stone weevil causing huge loss in marketable yield every year. So, management practices has been taken up to minimize the pest population up to ETL.

Technology (NCIPM, N. Delhi, 2017)

- Collection and destruction of infested and fallen fruits at weekly interval till harvest
- Spray main trunk, primary branches and junction of branches prior to flowering with Chlorpyriphos 20 EC @ 2.5ml/lt
- Spray Dimethoate (1ml/ltr) twice at 15 days interval when fruits are of marble size
- Smoking of Orchard by burning of crop residues/dry cow dung etc during evening hours

Result and Discussion

Application of IPM practices was found effective in reduction of pest population and per cent fruit infestation respectively. The result showed that per cent Mango stone weevil infestation was reduced to 3.3% in IPM as compared to 31.62% (Control). Marketable yield also increased by 37.81% over the control. However, maximum control may be achieved with Drone technology since high volume/motorized sprayer could not reach top of the trees for complete coverage of PP chemicals. Timely application of Chemicals is important as the infestation start at the beginning of Fruit setting (Marble size) where the larva enters the fruit burrowing through the flesh into the seeds until pupation.

Table 21: Effect of IPM practices on Management of Mango Stone Weevil

Parameters recorded	Technology	Control	Yield (t /ha)		% increased in yield over control	BC ratio
			Tech	Control		
Per cent Pest infestation	3.3	31.62	17.13	12.43	37.81	3.22
No. of fruit infested per Tree	7	24				
Marketable yield per Tree (Kg/yr)	122.31	66.50				

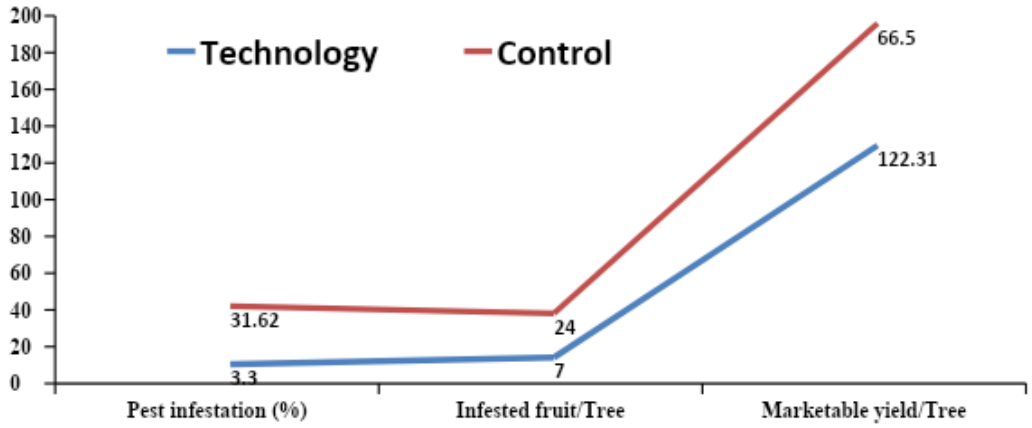


Fig. 21: Effect of IPM practices on Management of Mango Stone Weevil

Conclusion

Pruning is important in Mango tree to keep at normal height during the initial growth period in order to facilitate proper application of Plant Protection chemicals for effective management schedule. So, It is suggested that New plantation along with awareness on importance of pruning/training of Mango tree so as to increased production in terms of quantity and quality of Fruits for generating higher income from mango Orchard which otherwise Mango (Ranguai) production will gradually decrease with increase in Pest population year by year.

Action photos

IPM in Aphids & Diamond Back Moth of Cabbage

Introduction

Cabbage is an important vegetable crop having potential area of production and self-sufficient in Lawngtlai district. However, on the prevailing climate change Pests population drastically increased day by day which decreased crop production thereby causing low marketable yield in the Farming community. Diamond back moth (*Plutella xylostella*) and Aphid (*Brevicoryne brassicae*) are the two important pests of Cabbage. In view of healthy environment and human health, the most effective way of management, eco-friendly and socially acceptable method of Pest Management is IPM which aims to keeping Pest population at below ETL by employing all available alternative methods and techniques.

Technology (NCIPM, 2015)

- Mustard as trap crop (25 : 2)
- Yellow sticky traps @ 12 no's/ ha
- Spray *Bacillus thuringiensis* (1%) at 10 DAT
- Spray Neem oil (1%) at 20 DAT and repeat 2-3 times at 15 days interval

Result and Discussion

The result clearly showed that per cent pest infestation was significantly reduced with the technologies applied for management of major Insect pests of Cabbage. Per cent Aphids infestation was higher than Diamond back moth infested plants. The technologies demonstrated were found to be better result in Pest management & yield obtained as compare to farmers practice. The overall performance of the technologies was found satisfactory in reduction of Major insect pests of Cabbage which increased in yield by 24.18 per cent with BC ratio of 2.3. Dimond back moth (DBM) has developed resistance to multiple insecticides with different modes of action. Therefore, it is especially important to rotate insecticide modes of action to manage this pest. Do not apply more than two insecticides with the same mode of action within 10-14 day period

Table 22: Effect of IPM practices on management of Aphids & Diamond back moth of Cabbage

Target pests	Results of IPM Technology						
	Parameters recorded	Demo	Farmers Practice (FP)	Marketable Yield (Q/ha)		% Yield increase over FP	B:C ratio
				Demo	FP		
Diamondback Moth	Per cent infested plant	5.5	18.3	152	122.4	24.18	2.3
Aphids	Per cent infested plant	8.2	24				

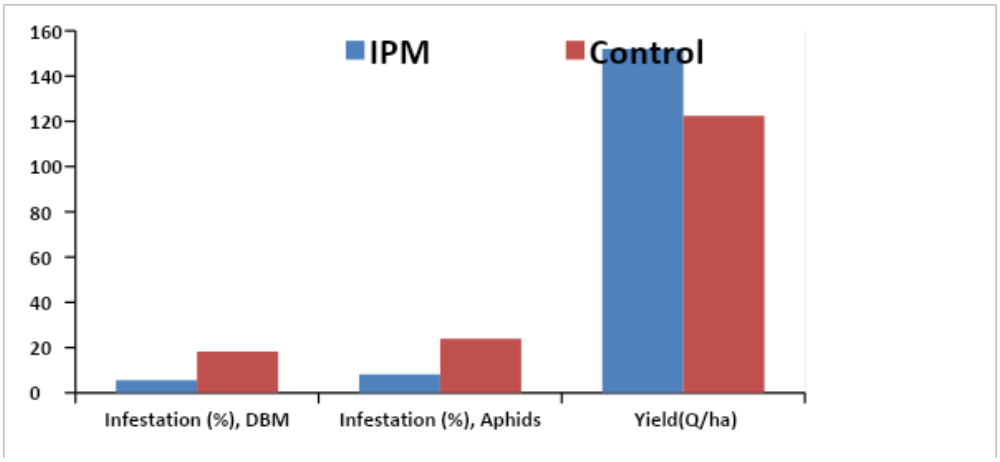


Fig. 22: Effect of IPM practices on management of Aphids & Diamond back moth of Cabbage

Conclusion

The IMP practices was found effective in reduction of Pests population with low infestation rate per unit area which increased marketable yield and income of farmers. The technologies applied were easy, low cost, easily available in the local market and also farmers acceptable that no chemicals pesticides involved harmful for humans and other livestock animals.

Action Photos

Management of Late Blight of Potato

Introduction

Late blight is a potentially devastating disease of potato, infecting leaves, stems and potato tubers. The disease spreads quickly in fields and can result in total crop failure if untreated. It is caused by Fungi *(Phytophthora infestans)* and the pathogen transmitted from infected seeds tubers (Seed borne disease). Once the disease established in the potato field, management should be applied as soon as the appearance of the disease as it easily spreads to the other plants. Application of specific fungicides for specific diseases is the ideal management measures. So, demonstration has been conducted successfully on management of Late blight of Potato in different villages of Lawngtlai District under the project funded by NABARD.

Technology (AAU, Jorhat, 2015)

- 1st spray of Mancozeb 75% @ 2.5g/lit at canopy closure (35-40 days after planting)
- 2nd spray of Cymoxanil 8% + Mancozeb 64% @ 2.5g/lit at appearance of the disease
- 3rd spray of Cymoxanil 8% + Mancozeb 64% @ 2.5g/lt after 10 days of 2nd spray
- 4th spray of Cymoxanil 8% + Mancozeb 64% @ 2.5g/lt at 10 days of 3rd spray

Results and discussion

The tested/trail technology was highly effective in reduction of disease incidence and spread of inoculums within the nearby areas. The disease incidence was found to be reduced by 71.68% and 74% reduction in wilted plants over the control practices. Early detection of the disease is important for timely application of management schedule to avoid spread of inoculums in the whole field. High humidity more than 90% and cloudy or foggy days persist for 6-7 days with atmospheric temperature in the range of 10-20 °C, Late blight develops rapidly with multiple infections on adjoining plants and then entire field through spread by the air-borne sporangia of the Fungus.

Table 23: Effect of Technology application on incidence of Late Blight of Potato over control

Parameters recorded	Technology	Control	Yield (Qlt /ha)		% increased in yield over control	BC ratio
			Technology	Control		
Per cent Disease incidence	6.23	22.0	313.40	237.35	32.04	3.32
Per cent wilted plant	4.4	17.5				

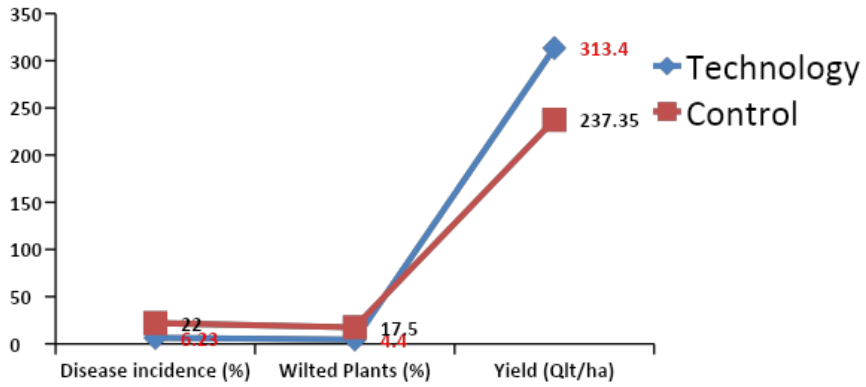


Fig. 23: Effect of Technology application on incidence of Late Blight of Potato over control

Conclusion

Losses in Potato yield can go as high as 80% in epidemic due to late blight infection. Therefore, management practices as well as prophylactic measure should adopt in the areas where Late blight prone area of cultivation for reduction of inoculums spread to the field.

Action Photos

Performance of Rainbow Rooster under Backyard System of Rearing in Lawngtlai District

Introduction

Backyard poultry production system is the most popular poultry farming practice in Mizoram. It is a handy enterprise with low-cost initial investment and generates employment among the poor people particularly women. It can be a source of supplementary income besides ensuring food and nutritional security for rural poor. Most of the backyard poultry production comprises rearing of indigenous birds with poor production performances. Therefore, an improved/dual purpose breed of birds which is higher in meat and egg production needs to be introduced in the district to improve the productivity and meet the demand of the ever growing population. KVK Lawngtlai has undertaken a crucial on-farm trial by introducing an improved breed of poultry that excels in both egg and meat production. This trial aims to assess the breed's adaptability to local conditions, its potential to boost poultry farming productivity, and the socio-economic benefits it can bring to small-scale poultry farmers within the district.

Technology (C.V.Sc, AAU, Khanapara, 2012)

The birds should be reared on standard chick starter ration during the initial six weeks under nursery rearing or brooding. After this, they were released under a free range or scavenging system in the open yard to collect the required protein, energy, minerals and vitamins etc from insects, snails, termites, seeds of grasses and weeds, leftover grains, crop residues and household wastes. The birds may be supplied with extra concentrate ration @ 30 to 60 gm/ day/ bird for better performance. Extra feed will depend on the free range availability, intensity of vegetation, availability of waste grains, insects, etc. Supplementation of calcium sources, especially during the laying phase, leads to a high rate of survival and good egg production. Vaccination was done as per the schedule for greater immunity. Deworming of birds done at 3-4 months interval to protect from internal parasites due to their scavenging nature.

Result and Discussion

Rainbow rooster rearing in the backyard system shows good results in terms of body weight gain and egg production compared to local birds rearing in the backyard system. The mortality percent was a bit higher in rainbow roosters but laid eggs much earlier than local birds. (Table). The main factors responsible for mortality were attack by predators followed by stress and diseases. Due to high resistance to poultry diseases and their free-range nature, rainbow rooster farming can be carried out with a low investment in backyard system.Therefore, it was observed during the trial that Rainbow roosters can sustain free-range and backyard rearing conditions and their productivity is much higher than local birds.

Table 24: Comparison between performance of Rainbow rooster and local birds under backyard system of rearing

Performance parameters	Rainbow rooster	Local bird (Zo Ar)
Mortality	13.33 %	8 %
Age at 1st laying (days)	176±1.56	214±2.10
Average body weight (Kg)		
4 months	1.45±7.98	0.820±5.08
8 months	2.50±15.36	1.26±8.10
12 months	3.42±24.06	1.67±14.40
Av. egg production up to 52 weeks (Nos.)	164±1.36	78±1.28
Average egg weight (g)	58±0.15	32±0.18
BC Ratio	2.4	1.5

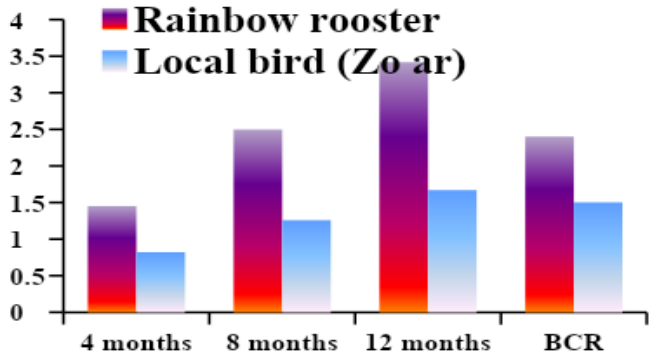


Fig.24: Comparison of average body weight (Kg) and BC ratio of RR and local birds

Conclusion

Rearing of Rainbow Roosters in a backyard poultry system offers various advantages such as faster growth rate, more egg production, high disease resistance, better economic return and market appeal, making them a recommended and preferred choice for small-scale poultry production when compared to local birds in Lawngtlai District, Mizoram.

Action Photos

Prevention & Control of Ecto-Parasitic Infected Skin Diseases in Pig

Introduction

Important external parasites causing skin diseases in pigs include mange, lice, fungi and ticks. External parasites infestation causes significant economic effects due to reduced growth rate, reduced feed efficiency, decreased fertility and loss of carcass value at slaughter. Mange is probably the most common skin problem in pigs. Different researchers have documented losses due to mange ranges from 2.5 – 10 % in rate of body weight gain and 2.5 – 13 % in feed efficiency depending upon the severity of infestation in finishing (adult) Pigs. One of the major problems diagnosed among the piggery farmers in Lawngtlai district is high incidence of skin diseases in pigs resulting in low production. Therefore, an on farm trial was conducted by KVK Lawngtlai to address the above problems which were likely causing economic losses for local pig farmers.

Technology (CAU Imphal, 2015)

The details of technology involve treatment of infected Pigs by using:

1) Ivermectin injection s/c @10 mg/30 kg. body weight
2) Cypermethrin (Tik out, Clinar) @ 100 mg/lts water or 1 ml/litre of water
3) Symptomatic treatment: Depending upon the severity of the infection, antibiotic, anti-fungal and other supportive treatments were also given.

Result and Discussion

The trial was conducted due to high incidence of skin diseases in pigs resulting in poor growth rate, reduced feed efficiency and loss of carcass value at slaughter. It has been observed that the skin diseases in pigs are usually mixed infections and generally subsided 1-2 weeks after treatment without affecting the growth rate and thus resulting in a good productivity. The treatment of pigs infected with skin disease using the above technology has shown several significant benefits when compared to untreated pigs. The treatment group exhibited a notably higher growth rate. This is attributed to the alleviation of the skin disease, which often causes discomfort, itching, and reduced appetite in infected pigs. By addressing the underlying condition, it allowed the treated pigs to consume more food and nutrients, promoting faster and healthier growth. The improved growth rate and overall health of treated pigs also translated into higher carcass value. Consequently, they yield higher-quality meat with greater market value. By eliminating or controlling the parasite or pathogen responsible for the skin disease, the treatment prevented further infections and outbreaks. This not only enhances pig welfare but also reduces the economic losses associated with disease management and treatment.

Table 25: Comparison between performance of treatment and control group of infected Pigs

Performance parameters	Treatment	Control (without treatment)	Remarks
Average body weight gain of Pig after treatment (Kg)	4 months : 0.328±0.50 6 months : 0.343±0.72 8 months : 0.418±1.36	4 months : 0.201±0.30 6 months : 0.215±1.52 8 months : 0.285±1.89	• Diseases usually subsided 1-2 wks after treatment • Usually mixed infections
Incidence of Skin diseases	Low	High	
General health status	Smooth and unbroken skin, normal & shining hair coat, good body weight gain	Stunted growth, dull skin, rough hair coat, discolored & thickening of skin	*Diseases persist for a long time without treatment resulting in poor body weight gain
BC ratio	2.3	1.7	

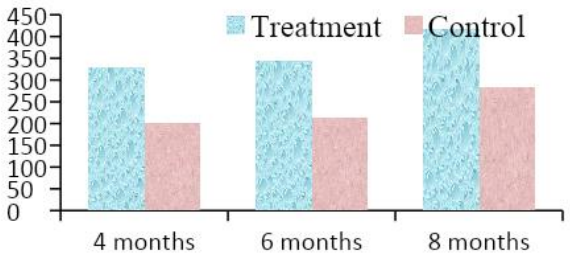


Fig. 25 : Comparison of average body weight gain (Kg) of Pig (treatment and control)

Conclusion

The trial successfully demonstrated the effectiveness of the intervention measures implemented to control and prevent ecto-parasitic skin diseases of pigs in Lawngtlai district. The timely and effective disease management contributes to improved growth rates, higher carcass values and a lower occurrence of skin diseases within the herd. It provides practical solutions that can be applied by local farmers. The successful results not only benefit pig farmers by improving their economic prospects but also promote animal welfare and sustainable livestock management practices.

Action Photos

Effect of Urea Molasses Mineral Block Supplementation on the Production Performance of Dairy Cattle

Introduction

The dairy Cows reared in Lawngtlai district are mainly indigenous or non-descript types of Cow breed in which the milk yield is already very low compared to the cross breed or indigenous high yielding Cows in other parts of India. Apart from this, the feeding management of the dairy farmers is also very poor. Concentrate feeds are usually not fed to the dairy Cow due to its high cost and unavailability in the market. Therefore, poor production performance in dairy Cow is mainly due to irregular and inadequate availability of quality feedstuff and imbalance feeding. It has been reported that 30 – 40 % concentrate allowances could be reduced by feeding UMMB without any loss of milk production. Therefore, a trial was conducted by KVK Lawngtlai to improve the production performance of dairy cattle by supplementing UMMB.

Technology

The source of technology is GADVASU, Ludhiana and it was released in the year 2012. The details of the technology includes:

T1: Control - No supplementation of UMMB

T2: Supplementation of UMMB ad libitum for licking to lactating Cows for a period of 3 months

Composition of UMMB:

1. Urea – 10 %
2. Molasses - 38 %
3. Wheat bran - 40 %
4. Mineral mixture - 5 %
5. Common salt - 1 %
6. Cement - 6 %

Size of wooden mould: 9” x 5” x 5”

✓ Dried the block under the shade for at least 8-10 days.

Result and Discussion

The trial was conducted in 5 villages of Lawngtlai district covering 10 numbers of beneficiaries. The lactating Cows were allowed free access to UMMB for at least 10-12 hrs in a day. It was provided in a wooden dispenser to allow free licking and to prevent biting off and over-ingestion of the block. Each block weighed about 2 kgs and the consumption of UMMB was monitored weekly by weighing the blocks regularly. The average consumption of UMMB ranges from 370-390 gram per day per Cow (380 g). Therefore, it has been observed that the average daily milk production is higher (5.8±0.04 litres) in dairy cows supplemented with UMMB than without UMMB supplementation (4.5±0.44 litres). Therefore, the trial suggested that UMMB significantly increased milk yield and the health status was also improved. UMMB through licking provides fermentable nitrogen, energy and minerals intermittently, necessary for optimum microbial growth. It also increased digestibility of low quality basal diets leading to improvement in milk production.

Table 26: Effect of UMMB Supplementation on the Production Performance of Dairy Cattle

	Technology	Control
Average milk yield pre-treatment (lit/day)	4.6±0.45	4.5±0.44
Average milk yield post-treatment (lit/day)	5.8±0.04	
Average milk yield increased within 3 months of treatment (l/day)	1.2	-
Annual milk production	1,566	1,215
General health status	Good (***)	Good (**)
B:C ratio	3.2	2.2

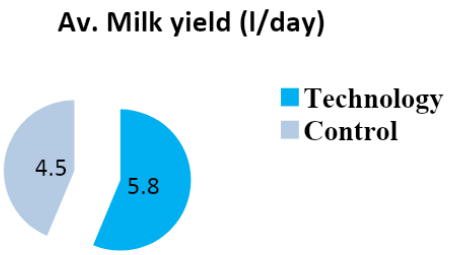


Fig. 26: Comparison of milk production between dairy Cow supplemented with UMMB and without supplementation of UMMB

Conclusion

Supplementation of UMMB increased digestibility of low quality basal diets leading to improvement in milk production. UMMB significantly increases feed intake, milk yield and growth rate. So, it can be concluded that UMMB is a cost effective approach to maximize the utilization of locally available feed resources for improved productivity in dairy cows.

Action Photos

Management of Piglets Anaemia in Pre-weaning Piglets under Farmers Field Condition

Introduction

Piglet anaemia is mainly caused by iron deficiency particularly when sows are maintained in an intensive system of rearing. The highest mortality up to 80 % of total death of piglets occurs during the pre-weaning period (0-8 weeks) especially during the first week of life. Piglet anaemia caused by iron deficiency, is one of the major reasons for loss/death of piglets before weaning. Moreover, iron deficiency also leads to increase in susceptibility of piglets to diseases such as pneumonia, influenza and gastro-intestinal tract disorder. Higher pre-weaning mortality of piglets will drastically affect the income of the pig farmers. In Lawngtlai district, many farmers have reported high mortality and poor growth rate of pre-weaned piglets. Therefore, a trial on management of piglet anaemia in pre-weaning piglets was undertaken by KVK Lawngtlai covering 20 numbers of farmers in various villages.

Technology

The source of technology is ICAR NEH, Barapani, 2008. The pre-weaning piglets are supplemented with iron by intramuscular injection on 4th and 14th day of birth **(Feritas** @ 1 ml I/M) ***(Feritas**: Iron sorbitol, folic acid, Vit.B12)

During the early pre-weaning period, piglets mainly depend upon its mother's milk for food and nutrition and the iron received from its mother's milk (sow) is only 1 mg/dl. This is not sufficient to provide the minimum requirement for normal healthy growth (7-8 mg/dl). So, to meet the necessary body requirement of iron, it needs to be obtained from another source. So, supplementation of iron by intramuscular injection on 4th and 14th day of birth lowered the pre-weaning mortality of piglets due to iron deficiency.

Result and Discussion

The trial was conducted due to high mortality and poor growth rate of piglets before weaning which may be due to iron deficiencies. The pre-weaned piglets were supplemented with iron by intramuscular injection of iron sorbitol (Feritas) @ 1 ml on the 4th and 14th day of birth. The mortality rate and average body weight of the piglets were recorded fortnightly. The result showed that the body weight of piglets supplemented with iron was higher (7.36±0.07 kg) than without treatment (6.16±0.21 kg) at the time of weaning and lower piglet mortality was also observed in the treatment group. Therefore, it can be concluded that supplementation of iron to the pre-weaning piglets is a recommendable technique for management of piglet anemia in pre-weaning piglets.

Table 27: Comparison of average body weight (Kg) and mortality % between treatment and control group

Performance parameters	Treatment	Control
Average Body weight at birth (Kg)	1.04±0.02	0.94±0.04
Ave. Body weight at 1st weeks (Kg)	1.78±0.06	1.46±0.09
Ave. Body weight at 4th weeks (Kg)	4.08±0.26	3.42±0.07
Ave. Body weight at 6th weeks (Kg)	5.88±0.24	4.80±0.07
Ave. Body weight at 8th weeks (Kg)	7.36±0.07	6.16±0.21
Average No. of Piglets at birth	9±0.44	9±0.31
Average No. of Piglets weaned	8.4±0.25	6±0.32
Mortality (%)	6.67	33.33

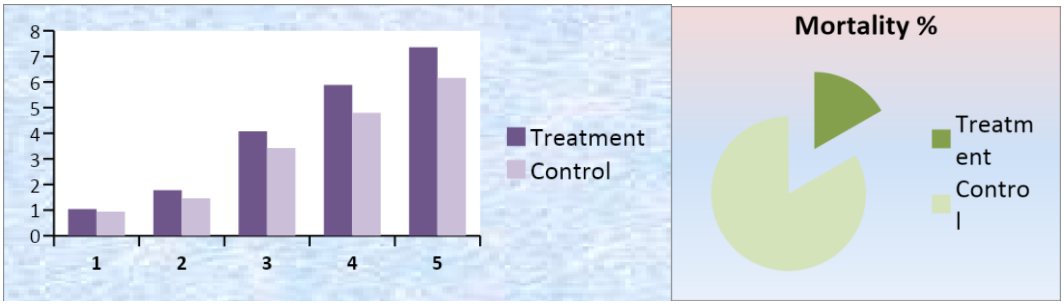
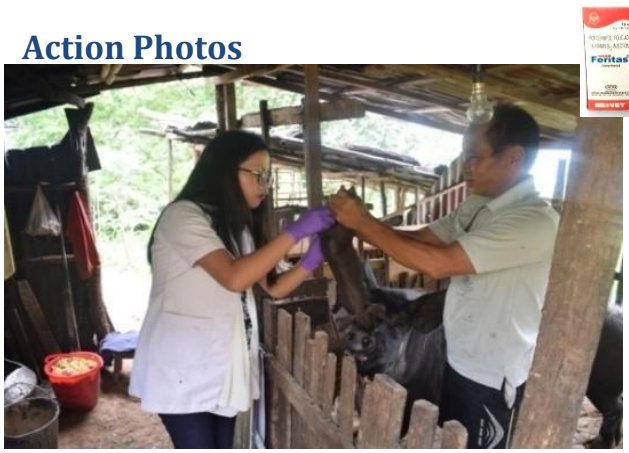


Fig. 27: Comparison of average body weight (Kg) and mortality % between treatment and control group

Conclusion

The administration of iron injections to pre-weaning piglets on 4th and 14th day after birth effectively prevented the development of piglet anemia. This intervention proved to be successful in maintaining the health and well-being of the piglets during their early stages of life, ensuring they had adequate iron levels to support their growth and vitality.

Action Photos



Assessment of Chelated Mineral Mixture on Milk Production in Dairy Cow

Introduction

'Chelated minerals' are minerals that have been combined chemically with amino acids to form complexes for greater bio-availability and better absorption. The upcoming livestock economy demands more effective production in every aspect for which feeding plays a major role. In this context, chelated minerals can be a better solution compared to other feeding inventions due to unavailability and high cost of concentrate feeds in the market in Lawngtlai district. This chelation process can enhance the absorption of minerals in the cow's digestive system. Improved mineral absorption is vital for various metabolic processes, including those related to milk production. In Lawngtlai district, the milk production is very low due to poor feeding/nutrition management of dairy cows. Therefore, there is an urgent need to develop a simple and low cost technology to increase milk production in the district.

Technology

The Source of technology is SAU, Gujarat. The technology involves supplementation of chelated mineral mixture Rigmin forte @ 30g/day/head for 90 days to the lactating Cows.

Result and Discussion

The feeding management of the dairy farmers in Lawngtlai district is very poor. Supplementation of vitamins and minerals to the lactating Cow is not generally practiced. So, supplementation of rigmin forte significantly increased the daily milk yield (6.2±0.08 L) leading to higher annual milk production in the dairy Cow and at the same time, the general health status was also improved. Lactating cows have increased nutrient requirements, including minerals like calcium, phosphorus and magnesium to support milk production. Chelated minerals can provide these essential nutrients in a highly bioavailable form, ensuring that the cow's body can efficiently utilize them. This can contribute to better overall health and potentially higher milk yields. By addressing mineral deficiencies and promoting overall health, chelated minerals can potentially reduce the risk of various health issues that lactating cows may face, such as metabolic disorders or susceptibility to infections. Healthy cows are more likely to maintain their milk production and reproductive efficiency.

Table 28: Parameters recorded on supplementation of chelated mineral mixture Rigmin forte

Performance parameters	Technology	Control
Average milk yield/head/Day (in Litres)	6.2±0.08	5.1±0.07
Average lactating period (in days)	290	290
Total milk production per head /year (in L)	1,798	1,479
Disease Resistance	High (***)	Low (**)
BC Ratio	2.8	2.2

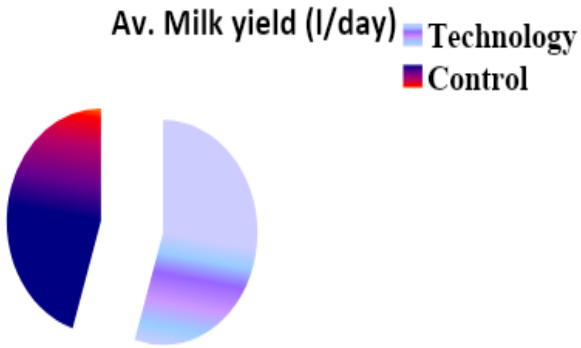


Fig. 28: Comparison of average milk yield (litre/day) between technology and control

Conclusion

In summary, supplementing lactating cows with chelated mineral mixtures can support increased milk production and improve their immune systems. However, the effectiveness of such supplementation may vary depending on the specific nutritional needs of the herd and the quality of the chelated minerals used. Regular monitoring of the cows' health and milk production, along with expert guidance, is essential to ensure the best outcomes for both the cows and the dairy operation.

Action Photos

Effect of Anthelmintic on the Production Performance of Goat

Introduction

Internal parasites can affect animals in subtle ways resulting in decreased growth, milk production and lower feed efficiencies. Internal parasites can also affect animals more severely leading to serious disease and death in some animals. Although Goats, like all other animals, have the capacity to cope with adverse environmental factors, minimization of the stresses associated with them has the potential of enhancing their health and productivity in terms of milk yield and growth rate. Gastrointestinal parasitism is one of the major constraints to the production of small ruminants heavily dependent on pasture grazing. With the advent of the broad spectrum anthelmintics, mortalities of livestock attributed to parasites have decreased significantly.

Technology

The source of technology is ICAR NEH, Barapani and it was released in the year 2008. The details of the technology involves regular deworming of Goat at 3 months interval with fenbendazole @ 7.5 mg/kg body weight. Fenbendazole is effective against a wide range of gastrointestinal parasites such as roundworms, tapeworms and lungworms. By reducing the parasite burden in goats, it helps prevent parasitic infections that can negatively impact their health and growth.

Result and Discussion

The trial was conducted due to low production performance of local Goat caused by high worm infestation. Regular deworming with broad-spectrum anthelmintic like fenbendazole (panacur) was done at the rate of 7.5 mg/kg body weight to the selected newly weaned Goat at 3 months interval and their growth rate, health status (occurrence of GIT disorder), mortality and age at puberty were recorded. The result showed that Goat regularly dewormed with fenbendazole demonstrated a higher growth rate, less occurrence of GIT disorder and improved the overall health compared to the Goat without treatment. Heavy parasite infestations can lead to poor nutrient absorption in the digestive tract, causing weight loss and stunted growth in goats. Fenbendazole's ability to eliminate these parasites can improve the absorption of nutrients from the goat's diet, leading to better growth. Chronic parasitic infections can weaken a goat's immune system, making them more susceptible to other diseases. By clearing out these parasites, fenbendazole indirectly supports the goat's immune function, helping them resist other illnesses. As a result of improved nutrient absorption and overall health, goats treated with fenbendazole often experience weight gain. This can be particularly beneficial for growing goats that need to reach a certain size or weight for market purposes or breeding.

Table 29: Comparison of average body weight (Kg) between treatment and control group

Performance parameters	Technology	Control
Mortality (%)	0	12.5
Average Body wt.:		
3 months (weaning)	2.85±0.20	2.81±0.21
6 months	5.36±0.32	4.30±0.30
9 months	7.65±1.2	6.38±1.35
12 months	11.08±2.0	9.13±2.4
Incidence of Parasitic Infestation	Rare	Severe. (Common in 3-12 months of age)
Occurrence of GIT disorders (Enteritis)	Less common (0-6 months of age)	Common in 0-6 months of age
Age at puberty	8 months	8 months
BC ratio	2.7	2.1

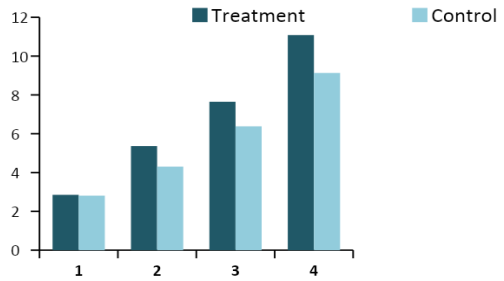


Fig. 29: Comparison of average body weight (Kg) between treatment and control group

Conclusion

It's crucial to follow proper dosage and administration guidelines when using fenbendazole. When using fenbendazole in goats raised for meat, it is also essential to observe the recommended withdrawal period. While fenbendazole can have positive effects on the health and growth of goats by controlling internal parasites, it should be used as part of a broader goat health management program. Regular deworming, proper nutrition, and good management practices are essential for maintaining the overall health and productivity of a goat herd. Therefore, it can be concluded that anthelmintic treatment is a simple and cheap way to increase the production and improve the health status of indigenous Goats.

Action Photos

Low Cost Feeding Management in Pigs

Introduction

Pig farming is a dynamic and economically significant sector of the livestock industry. However, the cost of inputs, particularly animal feed, remains a critical factor influencing profitability and sustainability. Low-cost feeding management in pigs is a critical aspect of sustainable pig farming, as it addresses the need to maximize productivity while minimizing expenditures. Rising feed prices have compelled pig farmers to explore innovative, economical and resourceful ways to meet the nutritional requirements of their animals. In this context, the utilization of tapioca silage as a feed resource for pigs has emerged as a cost-effective and sustainable solution that holds great promise for pig farmers. The potential disadvantages of tapioca roots are rapid perishability, their low protein content and the presence of cyanide in all root tissues. However, through simple processing, the disadvantages of perishability and cyanide can be overcome. Ensiling is the best method of preserving tapioca when the harvest coincides with the rainy season; the technique is simple, cheap and suitable for farm conditions. Under village conditions, ensiled tapioca roots can be used at levels up to 45 to 60% of DM in the diet of pigs without affecting the animals' health or overall performance; it also resulted in a 15.5-18.3 % reduction in feed cost when the diet was carefully balanced.

Technology

The source of technology is NRC on Pig, Rani and it was released in the year 2016. The details of technology involves:-

Tapioca Silage: 100 kg peeled sliced tapioca (1-2 cms) + 2 kg jaggery + 250 g salt. Tightly packed the mixture in polythene sheet, expel all air and keep it for 30-35 days

The roots were left to ferment naturally. The mixture could be used after 2-3 weeks of ensiling or could be stored for up to 6-8 months if not open.

Good tapioca root silage will be light brown in colour, succulent and have a pleasant smell.

Feeding Plan: Tapioca Silage: 45-60 % of the diet, Protein Supplement (Soyabean meal): 20-30% of the diet, Minerals and Vitamins: 2-3% of the diet, Fiber (Rice bran): 5-10% of the diet

Results and Discussion

Feeding tapioca silage along with protein supplements to pigs can indeed be a cost-effective and efficient way to increase their growth rate while reducing feed costs. However, it's essential to understand the nutritional value and potential challenges associated with this feeding strategy. Tapioca root is a good source of carbohydrates, providing energy for pigs. This energy can support growth and maintenance. It cannot be used as the sole feed to pigs. It is low in protein, minerals and vitamins. These nutrients must be given in the form of supplements when you feed tapioca silage. There are many feeds that can supply protein to pigs namely soyabean meal, fish meal etc. Maintaining the protein allowance at a level of 200 g/pig/day throughout the growing-finishing period gave reasonably high growth rates and good economic returns.

Table 30: Comparison of average body weight (Kg) of Pigs between technology and control

Performance parameters	Technology	Control
Body weight at (Kg)		
4 months	36.50 ± 1.12	34.50 ± 1.35
6 months	53.0 ± 1.59	48.30 ± 1.11
8 months (Market age)	74.0 ± 1.80	65.70 ± 1.38
BC ratio	2.4	2.0

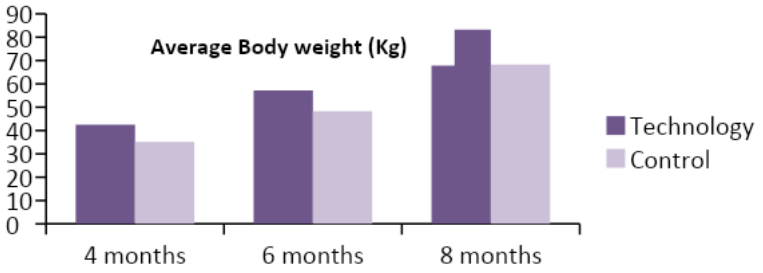


Fig. 30: Comparison of average body weight (Kg) of Pigs between technology and control

Conclusion

Feeding tapioca silage along with protein supplements to pigs can be an effective strategy to increase growth rates and reduce feed costs. Ensiling chopped tapioca roots appeared to be as effective as sun-drying in reducing cyanide levels to non-toxic proportions. Careful formulation of the diet is necessary to ensure the right balance of energy, protein, vitamins, and minerals for pigs at different growth stages.

Action Photos

Small Scale Composting

Introduction

Composting is the natural process of 'rotting' or decomposition of organic matter by microorganisms under controlled conditions. Raw organic materials such as crop residues, animal wastes, food garbage, some municipal wastes and suitable industrial wastes, enhance their suitability for application to the soil as a fertilizing resource, after having undergone composting. Compost is a rich source of organic matter. Soil organic matter plays an important role in sustaining soil fertility, and hence in sustainable agricultural production. In addition to being a source of plant nutrient, it improves the physico -chemical and biological properties of the soil. As a result of these improvements, the soil: (i) becomes more resistant to stresses such as drought, diseases and toxicity; (ii) helps the crop in improved uptake of plant nutrients; and (iii) possesses an active nutrient cycling capacity because of vigorous microbial activity. These advantages manifest themselves in reduced cropping risks, higher yields and lower outlays on inorganic fertilizers for farmers.

Technology

Under this method, the raw materials utilized for compost making are:

- animal manure: from cows, pigs, poultry, ducks, etc.;
- crop residues and weeds: maize, bean, groundnut, tea and weeds;
- wood cuttings
- topsoil from the forest or from an uncultivated or sparingly cultivated area;
- fresh water.

The raw materials are put in layers in the following sequence:

- a layer of crop residues (20 cm)
- a layer of topsoil (2 cm);
- a layer of manure (5-10 cm).

Ash (50 g/m^2) is then spread on the surface, and freshwater is sprinkled on the material
The compost pit size should be about 1m deep and 1.5-2m wide. The above steps are repeated until a height of about 1-1.2 m is reached. It is recommended to begin the heap by constructing a lattice of old branches, and to place two or three woodcuttings vertically along the lattice in order to facilitate ventilation. The heap should be 2 m × 1-1.2 m × 1-1.2 m. Once a week water should be added to the heap. However, too much water could lead to the leaching of nutrients. After three weeks, the heap must be mixed to ensure that all materials reach the centre. During the process, the temperature rises to 60-70 °C, and most weed seeds and pathogens are killed. While it may take about two to three months to prepare the compost in a warm climate, in cold regions it could take five to six months

Result and Discussion

Compost has been considered as a valuable soil amendment for centuries. Most people are aware that using composts is an effective way to increase healthy plant production, help save money, reduce the use of chemical fertilizers, and conserve natural resources. Compost provides a stable organic matter that improves the physical, chemical, and biological properties of soils, thereby enhancing soil quality and crop production. When correctly applied, compost has the following beneficial effects on soil properties, thus creating suitable conditions for root development and consequently promoting higher yield and higher quality of crops.

Table: 31. Economic return of Small scale Composting

Parameters	Result
Yield	150 kg/1000kg/year of compostable waste
Net return	Rs.6000(@Rs40/Kg

Conclusion

This is to concluded that the growth of compost industry over years, more and more people are getting into the at home or commercial composting in order to minimize their waste and save natural resources. Its helps farmers to enrich the soil and retaining moisture and a profitable venture for the farm women for entrepreneurship development.

Action Photos

Preparation of Mango bar

Introduction

Rangkuai variety of mango called 'Kawlchaw theihai' has been growing and selling for so many years by many families of Kawlchaw village and other neighbouring villages. Although it is very delicious, it is vulnerable to pest called mango stone weevil. This brings immense loss for the farmers since it cannot be manageable by plant protection measures. But with the help of processing technology the edible portion of infested fruits were collected and processed into value added product called 'Mango Bar'.

Methodology (Tamil Nadu Agricultural University, 2016 Coimbatore)

1. Mango pulp heated for 3 min
2. Mixed with corn flour paste
3. Add milk powder
4. The mixture was heated on medium flame by stirring continuously upto a final TSS of 45^{o}Brix
5. The concentrated pulp was cooled to room temp and KMS added and mixed thoroughly
6. The finished pulp was spread evenly in alluminium tray to a thickness of 0.5 cm and dried at 60^{o}C for 6 hr in a cabinet drier

Results & Discussion

Addition of additives such as cornflour and milk powder increase cost of production. Mango bar can also be prepared without any other additives to reduce cost of production. Addition of sugar increase drying period as well as cost of production. Saccharin is a very good substitute for sugar to reduce drying period and cost of production. Addition of potassium meta-bisulphite was found to reduce non enzymatic browning. Since farmers cannot afford modern driers, sun drying (drying inside poly-house) is employed for making mango bar which permits the final product to have a translucent appearance, a normal colour and a gummy texture. The storage stability varies according to the moisture content of the product. When the product is completely dry it can be stored up to eight months at room temperature.

Table 32: Results of different parameters recorded on Mango bar

Parameters	Results
Economic analysis (9 nos. of fruit=1000 gm pulp 6 packets @Rs.20/pckt	Input – Rs. 51/- Output – Rs. 120/- Profit - 69
B:C ratio	2.4:1
Drying time	3 days under sun drying
Storage stability	8 months
Consumer acceptance	85%

Conclusion

It can be concluded that highly acceptable and shelf stable fruit bar can be prepared from unmarketable mango. It is an opportunity for exploring the possibility of producing other value added products in order to preserve the fruit during off season and also to reduce post-harvest losses. Utilizing culled and unmarketable mangoes for development of this product will not only be beneficial for farmers but will also good for consumer of fruit products also.

Action photos

Popularization of Mango squash preparation

Introduction

Rangkuai varierty of Mango also known as 'Kawlchaw theihai' is a native of Kawlchaw village, Lawngtlai district Mizoram. Although it is mainly confined to the bank of river Kolodyne (also called Chhimtuipui), some of the neighbouring village of Kawlchaw west village such as Sihtlangpui, Chawntlangpui and Saikah were also growing and selling rangkuai. The variety is known for its quality and taste in the region and over the years this variety has shown some unique traits. It is believed that Rangkuai performs best in terms of quality in this geographical pocket of the state compared to other regions. Fruit is sweet in taste, juicy pulp, less fibred and good aroma. Single fruit costs approximately Rs.20 in the market during the season. Even though this variety of mango is delicious, it is highly infested by stone weevil which severely reduces its commercial value and a single fruit cannot be sold for a rupee. But with the help of processing technology the edible portion of infested fruits were collected and processed into value added product called 'Mango Squash'.

Methodology *(Tamil Nadu Agricultural University, 2014 Coimbatore)*

(Per Litre of mango pulp)

1. Selection of fruit, washing, pulping
2. Preparation of syrup (sugar 1.2 Kg + water 1 Litre + acid (20g), heating just to dissolve)
3. Straining
4. Mixing with juice
5. Addition of preservative (0.6g KMS/litre squash)
6. Bottling and capping
7. Storage at room temperature and refrigerator

Results & Discussion

Approximately ten (10) numbers of fruit can yield one thousand (1000) grams of mango pulp. Squash was made into various proportions of sugar and acid such as 1.2 Kg, 1.5 Kg and 1.75 Kg of sugar and 20 gram, 25 gram and 30 gram of citric acid respectively per litre of mango pulp. 1.2 Kg of sugar per litre of mango pulp is an ideal amount since it gives ideal TSS to the final product i,e. 45^{o}Brix. Since farmers were using their farm produce of mango, the cost of production was highly reduced. Artificial colour and flavour were not added. The colour of the finished product may vary depending on the degree of ripeness of the fruit. No progressive deterioration was found in colour, flavour, consistency and overall acceptability during storage period of eight months. The squash can be pasteurized with bottles when use glass bottles, but can also be pasteurized in a pan for PET bottles. The shelf life was extended to eight months as a result of both pasteurization and chemical preservative.

Table 33: Results on different parameters recorded on Mango squash

Parameter	Result
Economic analysis (per 30 nos. of fruit) 3.6 L pulp, 11 bottles of squash	Input- 390 Output- 1100 Profit- 710
B:C ratio	2.8:1
Shelf life	8 months
Sensory evaluation	Colour and taste do not change during the storage period of 8 months

Conclusion

It can be concluded that mango squash can be successfully processed by using unmarketable mango. Sensory evaluation and shelf life studies showed that the product can be utilized for several months despite of fruit's short harvesting period and availability. The processing is simple yet it helps in preserving the unmarketable mango. This technology needs to be promoted as it helps in preserving the unmarketable mango for longer period as well as it reduces the post-harvest losses.

Action photos

Preparation of Guava Cheese

Introduction

Guava *(Psidium guajava)* apple of the tropics is one of the most common fruits in India. It is a rich source of ascorbic acid, pectin and contains considerable amount of calcium, phosphorus, iron and crude fibre. Guava is a seasonal fruit and highly perishable with very short shelf life. Under these conditions guava growers fail to get attractive returns and a lot of produce goes as waste. Value addition is a good alternative for its preservation, as well as utilization of culled/ damaged fruits.

Technology (Div. of Horticulture ICAR Research Complex for NEH Region)

1. The fruits are washed, halved, core portion scooped out and cooked in equal amounts of water for softening to make pulp
2. For every kilogram of pulp, 1.25 – 1.50 kg sugar, 3gm citric acid and 56gm butter is added.
3. This mixture is cooked to a thick paste or until the mixture reduces to less than half.
4. Small amount of permitted colour is added to improve its aesthetic value.
5. Hot cheese is spread on a butter smeared tray (for easy removal later) and allowed to cool and set overnight.
6. After cooling, it is cut into pieces of desired shapes and sizes, and wrapped in butter paper/ cling films

Result & Discussion

Shelf stable guava cheese was developed to evaluate the utilization of wasted guava fruit. It can be stored for 3 months at room temperature and upto 6 months in refrigerator. The prepared guava cheese has good texture, colour and taste. The materials are less costly and farmers could easily adopt to increase their income by formation of guava cheese in the glut period. *Guavas have natural pectin which acts as a gelling and thickening agent. In order to extract as much pectin as possible, we need to simmer the fruit pieces in water for about 10 minutes and extract the pulp before adding sugar.

Table 34: Results on different parameters recorded on Guava cheese

Parameter	Result
Economic analysis (21 nos. of guava/ 1000 gm pulp/ 28 pkts of guava cheese)	Total cost (Rs.)- 120 Gross Income (Rs.) - 280 Net Income (Rs.) -160
B:C ratio	2.3:1
Shelf life	3 months at room temperature
Organoleptic analysis	Texture, taste and colour do not change upto 3 months at room temperature

Conclusion:

This technology indicates that good quality cheese can be prepared using local variety of guava. Guava is processed into few popular products like jam, jellies, preserve, chutney and cider. Guava cheese is one such product which is believed to have an excellent market reputation. The nutrient value of guava coupled with the taste of cheese can have an enormous demand in the market. It is liked by people of all age because it does not only provide nutrition but also add taste to the pulp.

Action photos

Osmotic Dehydrated Pineapple Slices

Introduction

Pineapple (*Ananas comosus*) is non-climacteric fruit grown widely in Mizoram. It is rich in vitamin C, magnesium calcium, potassium, iron and the protein digestive enzyme, bromelin. Kew and Queen are the two promising cultivars of pineapple In North East India. Kew variety is characterized by the big sized fruits (1.5-2.5 kg) which are oblong and tapering slightly towards the crown. The flesh is light yellow and very juicy when ripe. Queen variety fruits are of the weight 0.9-1.3 kg in general. The flesh is deep golden-yellow less juicy than Kew, crisp textured with a pleasant aroma and flavour. Pineapple plants flower 10-12 months after planting and fruits become ready 16-18 months after planting. In natural condition it is harvested during May-August. Fruits which mature in the winter are acidic. The fruits with crown can be kept for 10-15 days after harvesting. Upto 40% of agricultural produce is wasted in developing countries, mainly due to the lack of storage and processing facilities, as well as due to the limited knowledge of processing technologies.

Application of osmotic dehydration for different fruits has been increased significantly in recent years. Among different fruits, pineapple has characteristic pleasant flavour, distinct aroma and exquisite taste and is one of the most suitable fruit used for osmotic dehydration. Osmo dehydration is one of the relatively simple preservation techniques for processing of fruits which does not require any sophisticated equipment. So the pineapple growers can use such type of technique and can convert pineapples into dehydrated form during the excess production and to reduce huge post-harvest losses. In the osmotic dehydration process, partial dehydration of the fruit pieces is accomplished by dipping in concentrated sugar syrup solution followed by hot air dehydration. It is a useful technique for producing safe, stable, nutritious, tasty, economical and concentrated fruit products.

Technology

(Department of Horticulture, Sam Higginbottom University of Agriculture, Technology and Sciences, Allahabad, Uttar Pradesh, India)

- Slicing off the top of pineapple and remove the skin
- Coring the fruit by placing corer in the middle and push corer through the pineapple
- Slicing of pineapple into 6 mm thickness in circular shape.
- Steeping in sugar solution of 50^{o}Brix for 24 hours
- Draining and drying in hot air oven or sun

Result & Discussion

One pineapple can yield 10-15 slices of fruit depending on the size of the fruit and thickness of slices. The sugar syrup can be recycled upto six times which will greatly reduce cost of production. Drying time varies depending upon the thickness of slices. Rinsing quickly with water to remove sugar syrup adhering to fruit pieces before drying shorten the drying

time. The products prepared from pineapple by osmo-dehydration process remain good upto 8 months of storage at room temperature. The product is excellent in sensory quality such as colour, flavour, taste, texture and overall acceptability.

Table. 35. Different parameters reading on osmotic dehydrated Pineapple slices

Parameter	Result
Economic analysis 1 pineapple = 15 slices	Total cost (Rs.) – 100 Gross Income(Rs.) – 150 Net Income(Rs.) - 50
B:C ratio	1.5:1
Drying time	6-9 hours in hot air oven and 5 days in sun
Sensory analysis	Colour, flavor, taste, texture do not change during the storage period of 8 months
Storage stability	8 months at room temperature

Conclusion

This is a 'ready to eat' high quality snack food with extended shelf life, preserving natural qualities of pineapple. By developing this value added product, it is possible to make the seasonal fruit available to the consumers throughout the year. This technology could be used on small scale for development of self- entrepreneurs and home scale industries. Consumption of such nutritional and valued products could be popularized through exhibition and media.

Action photos

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