

TECHNOLOGY PACKAGE FOR HIGHER PRODUCTIVITY AND PROFITABILITY OF GOA LOCAL COWPEA



ICAR Research Complex for Goa

(Indian Council of Agricultural Research)

Old Goa - 403 402, Goa, India.



TECHNOLOGY PACKAGE FOR HIGHER PRODUCTIVITY AND PROFITABILITY OF GOA LOCAL COWPEA

**B.L.MANJUNATH
R.RAMESH
R. MARUTHADURAI
H. R. PRABHU DESAI
N.P.SINGH**



**ICAR Research Complex for Goa
(Indian Council of Agricultural Research)**

Old Goa - 403 402, Goa, India.

Published by

Dr. N. P. Singh

Director

ICAR Research Complex for Goa

Old Goa - 403 402, Goa, India.

Fax : 91-832-2285649
Phone : 91-832-2284678, 2284679
E-mail : director@icargoa.res.in
Website : <http://www.icargoa.res.in>

Copyright © 2013, Indian Council of Agricultural Research (ICAR)

All Rights Reserved. For reproduction of this document or any part thereof, permission of Indian Council of Agricultural Research (ICAR), New Delhi must be obtained.

Authored by: **B.L.Manjunath, R.Ramesh, R. Maruthadurai, H. R. Prabhu Desai & N.P.Singh**

Correct Citation:

B.L.Manjunath, R.Ramesh, R. Maruthadurai, H. R. Prabhu Desai & N.P.Singh (2013). Technology Package for Higher Productivity and Profitability of Goa Local Cowpea. Technical Bulletin No. 31, ICAR Research Complex for Goa (Indian Council of Agricultural Research), Old Goa-403402, Goa, India.

Technical Assistance: Shri S. K. Marathe

Printed at: **Impressions, Belgaum**



भारत सरकार
कृषि अनुसंधान और शिक्षा विभाग एवं
भारतीय कृषि अनुसंधान परिषद
कृषि मंत्रालय, कृषि भवन-II प्लॉट, नई दिल्ली 110112

INDIAN COUNCIL OF AGRICULTURAL RESEARCH
KRISHI ANUSANDHAN BHAVAN-11, PUSA, NEW DELHI 110 112
Ph. : 91-11-25848364 (O), 24121571 (R)
Fax: 91-11-25848366
E-mail: aksikka@icar.org.in., aloksikka@yahoo.co.in

डॉ. अलोक कुमार सिक्का

उप महानिदेशक (प्रा. सं. प्र.)

Dr. Alok K. Sikka

Deputy Director General (NRM)

FOREWORD

Among the pulses, cowpea holds an important position in the country. Known as vegetable meat owing to its high protein content (25%), cowpea is used for human consumption, as concentrate feed for cattle, fodder and green manure crop. It performs well in many cropping situations owing to its ability to tolerate moderate droughts and the capacity to fix atmospheric nitrogen, thereby improving the soils. Cowpea can be cultivated both as pure crop and as mixed crop in association with cereals, other pulses and oilseeds. The protein in cowpea seed is rich in the amino acids such as lysine and tryptophan compared to other legumes; hence, cowpea seed is valued as a nutritional supplement to cereals and as a protein source.

In Goa and adjoining areas, cowpea is the traditionally grown major pulse crop especially in the rice fallows under residual moisture situations. Goan cowpea (locally called *Alsando*) is a bold-seeded type producing high biomass and fleshy pods. It is fairly tolerant to drought situations and is suitable for the residual moisture situations in rice fallows. It is learnt that this local cowpea is preferred in many of the culinary preparations owing to its bold size, better cooking quality and unique taste and premium price in the market.

Goa region is known to have wide variability both for phenotypic and genotypic traits of cowpea. I am happy to note that ICAR Research Complex for Goa made efforts to collect germplasm exhibiting wide variations to select a high yielding type with better seed size and also publishing a Research Bulletin entitled "TECHNOLOGY PACKAGE FOR IMPROVED PRODUCTIVITY AND PROFITABILITY OF LOCAL COWPEA" to showcase the cowpea research carried out at the Institute.

I trust that this compilation will help in developing high production packages and for formulating future research and extension strategies relevant to the farming community. I am sure that this bulletin will serve as a reference material to all those involved in the production of cowpea and will go a long way in improving the pulses production and livelihood security for small and marginal farmers of the region.

My best wishes on the occasion.


(Alok K Sikka)

PREFACE

Cowpea is one of the major pulse crops of the West coast region. The crop is widely grown in rice fallows under residual soil moisture without much management. The Goa local cowpea known for its unique taste and boldness attracting premium price in the market, need to be promoted so as to harness better returns for the farmer. Although, the crop is grown over the periods, there is no standard package available for this unique crop cultivar.

Keeping this in view, ICAR Research Complex for Goa, right from 2002 has undertaken systematic survey in major cowpea growing areas of Goa so as to identify a superior accession with desirable attributes for large scale cultivation. Research efforts at various levels have given a renewed direction to this crop to improve production and productivity.

This technology package bulletin is a result of research work carried out at ICAR Research Complex for Goa for over a decade in this direction. The research efforts and the achievements have resulted in identifying 2-3 profitable accessions and standardisation of production package of local cowpea for the benefit of growers, developmental agencies and the planners.

While bringing out this bench mark publication, we sincerely acknowledge the invaluable contributions rendered by various visionaries, research workers and scientists and Indian Council of Agricultural Research, New Delhi for encouraging the research on this aspect.

Our sincere thanks are to Dr. V.S. Korikanthimath, the former Director, ICAR Research Complex for Goa for his inspiration and constant encouragement. Indebted thanks are due to various scientists of the Institute viz. Dr. A.R Desai, Dr. M.Thangam, Smt. Sunetra Talaulikar for their immense contributions.

The conduct of various on-farm trials and frontline demonstrations on the crop over the years was possible with the co-operation of progressive farmers of Goa who deserves high appreciation.

B.L.MANJUNATH
R.RAMESH
R. MARUTHADURAI
H. R. PRABHU DESAI
N.P.SINGH

Contents

Sl No.	Particulars	Page No.
I.	Introduction.....	1
II.	Varieties.....	2
III.	Cultural Practices	
	1. Time of sowing.....	5
	2. Land preparation.....	5
	3. Seeds and sowing.....	5
	4. Inter-cultivation.....	5
	5. Water management.....	6
	6. Manures and fertilizers	6
IV.	Integrated management of pests and diseases	
	1. Management of aphids.....	7
	2. Seedling diseases	10
	3. Foliar diseases.....	11
V.	Harvesting and Threshing:.....	14
VI.	Storage.....	15
VII.	Results of on farm trials and front line demonstration	15
VIII.	Economics of cultivation	16

I. Introduction

Cowpea is a major pulse crop in the West coast region and is grown extensively as a rice fallow crop under residual moisture situations. Although, the crop comes up easily without much management, the productivity levels of the crop in general are very low.

Goa cowpea (locally called *Alsando*) is a bold seeded type with a viny growth producing higher biomass.

It produces lengthy bold and fleshy pods. It is fairly tolerant to drought situations and suits for residual moisture situation in rice fallows. Goa local cowpea is preferred in many of the culinary preparations owing to its bold size with soft texture, better cooking quality, exquisite taste realizing high value from the produce.

Every 100 g cowpea contains 25-28g vegetable protein, 50-60g carbohydrates and 4g minerals and other trace elements required for healthy diet. Cowpea fixes 45-150kg atmospheric nitrogen per ha by virtue of the biological nitrogen fixation through root nodules.

The crop also helps in smothering

weeds (20-45%) when grown as intercrop in widely spaced crops. It demands no irrigation and improves soil biotic life at the same time enriching the soil fertility.

Climate

The crop requires warm and humid climate with temperature between 29-35°C. In Goa, "*Alsando*" serves as a dual purpose pulse being cultivated both in *kharif* (June-Sept) mostly for green leafy vegetable purpose in lateritic uplands (*Morod*) and also as an intercrop in horticultural crops while the major area is during *rabi* (December- March) as a rice fallow crop under residual soil moisture situations. Delay in sowing beyond January during *rabi* season, leads to delayed seedling emergence and seedling vigour, exposing the crop to moisture stress.

Soil

Goa cowpea comes up well under sandy, sandy loam and alluvial soils. However, it can also be grown in lateritic soil with good water holding capacity. Soils with satisfactory organic carbon (>0.6 %) give good response to it's cultivation.

II. Varieties

One of the main reasons for the low productivity of cowpea is lack of a suitable high yielding variety of the crop. Sporadic attempts to introduce few high yielding types of small seeded cowpea were although made, yet these varieties could not become popular among the farmers owing to local preferences for bold grain types. This is because Local Cowpea (Alsando) is a delicacy in the region owing to its unique taste and bold sized seeds.

ICAR Research Complex for Goa

with its research efforts in collection, cataloguing, evaluation and selection for specific traits over a period of last one decade, has identified three selections of local cowpea with specific advantages.

Alsando-1:

It is a determinate type of local cowpea selection with bold pods and high yield. It grows to height of 55 cm with 3-4 primary branches under normal conditions. It responds well to a spacing of 45 cm and facilitate to accommodate more plants per



Alsando-1, a high yielding determinate type local cowpea with short duration

unit area. Under ideal conditions the selection produces 12-13 long pods having a length of 24-25 cm with 15-16 seeds per pod. The test weight of the selection is around 20-21g/100 seeds. The harvest index of the selection is quite high (0.54). The selection has a potential seed yield of 1290 kg/ha and a haulm yield upto 3t/ha. It takes about 47 days to flower and matures in 90 days.

Goa Nadora (Nadora Bardez-4):
It is an indeterminate type of local

cowpea selection with bold pods and high yield. It grows profuse with dense foliage (upto 44 trifoliate leaves/plant) with 2-3 primary branches under ideal conditions. The selection takes 63-65 days for flowering with a total crop duration of 100 days. It produces pods in clusters with 6 to 10 pods/plant having a length of 18 to 22cm. Normally each pod will have 10 to 14 seeds with a test weight of 24 g for 100 seeds. The selection has a potential seed yield of 1630 kg/ha and a haulm yield of 3.31 t/ha.



Goa Nadora, a high yielding indeterminate type local cowpea with cluster bearing

**Dhulape
Cowpea-3) :**

Utorda-3

(Goa

It is also an indeterminate type of local cowpea selection with bold pods and high yield. Under ideal conditions, it grows to a height of about a feet with profuse dense foliage (upto 40 trifoliate leaves/plant) with vine growth upto one metre having 4-5 primary branches. The selection

takes 68-70 days for flowering with total crop duration of 100-105 days. Each plant produces 14-20 smooth greenish white pods in clusters measuring 23- 25cm.

Each pod will have 13 to 17 light brownish seeds having a test weight of 25 g for 100 seeds. The selection has a potential seed yield upto 2000 kg/ha and a haulm yield of 4.30 t/ha.



DU-3, a high yielding indeterminate type local cowpea with profuse biomass

III. Cultural Practices

1. Time of sowing:

The time of sowing assumes great importance since the crop is taken on residual moisture of the soil. The optimum sowing time should be decided based on the available soil moisture after planking which is done mainly to conserve soil moisture. Early sowing coupled with enhanced seed rate and adequate seed treatment leads to uniform germination and optimum plant stand which is the key to higher per unit productivity. November second fortnight to December first fortnight is ideal under Goa conditions, in light textured (sandy) soils under rice fallows.

2. Land preparation:

Prepare the land by ploughing at right moisture situation with a MB plough or stir the soil using a rotavator and level the surface by planking to conserve the moisture. Take care to uproot the weeds fully and allow them to dry out.

3. Seeds and sowing:

Maintenance of optimum plant population in field is a key to bumper harvest. Use only a local

cowpea selection having higher yield potential which is more economical. About 35-40 kg seed is required to plant one ha. Before sowing, the seed is soaked in water for 4-6 hrs followed by drying in shade. Treat the seed with *Trichoderma* @10g/kg and with phosphate solubilising bacteria (PSB) culture @10-15g/kg seed before sowing. Further, treat this seed with 375-500 g of *Rhizobium* before sowing specially in newly cultivated areas so as to ensure the benefit of biological nitrogen fixation.

Sowing is done by opening furrows with a cultivator or plough with required spacing (45 cm for Alsondo-1 Selection and 60 cm for Goa Nadora and Goa Cowpea-3) in straight lines. Treated seeds are then sown at 15-20 cm distance in the furrows and immediately covered with soil and the field is planked to reduce moisture loss. It is better to sow in plough-sole so as to place the seed in the moist zone at a depth of 5 cm.

4. Inter-cultivation:

Time of weeding is as important as weeding itself. Hoeing and weed management contributes for substantial increase in yield. The critical period of weed-crop competition is the initial period of 25-

45 days after sowing. The field is kept weed free by moving rotary weeder between the lines once at 20-25 days of sowing and again after 15-20 days so as to keep the field weed free.

5. Water management:

The requirement of water for cowpea is minimum. Normally the crop is taken purely on available soil residual moisture during *rabi* season. However, it is observed that one irrigation during flowering stage enhanced the pod yield by 20-30%.

6. Manures and Fertilizers:

After the population maintenance, the primary reason for low yields is nutrient management. The fertilizer requirement has to be decided based on soil test report after the harvest of paddy. In general, application of 10-25 kg N, 50-60 kg P_2O_5 and 25-30 kg K_2O gives better response with increased yield.

In Goa, due to high rainfall and presence of iron and aluminium in soils, the phosphorous gets fixed into the soil and is not available for plant for active root uptake. Therefore, it is advisable to apply phosphorous in the

form of rock phosphate (Uniphos) or DAP and potash in the form of Muriate of Potash. Apply Rock Phosphate @ 250 kg / ha during sowing preferably in the planting lines to ensure better fertilizer use efficiency.

By application of organics, efficient and effective nutrient cycle will be developed which also enhances the activity of *Rhizobium* and phosphate solubilising bacteria (PSB). Use of PSB @10kg/ha) either as seed treatment or soil application along with farm yard manure will facilitate phosphorous release and uptake by the plants.

In order to provide micronutrient needs of the crop, $ZnSO_4$ @ 25kg and 2kg molybdenum is recommended/ ha which will depend on the soil test values for these micronutrients.

Foliar fertilization may be practiced with 2% DAP (200g dissolved in 10 litres of water) at flowering (40- 45 DAS and second spraying at pod initiation stage (70-75 DAS) which considerably increases the final pod yield and the test weight of harvested produce due to enhancement in the accumulation of photosynthates in reproductive parts. The yield increase may range from 20 to 35% .

IV. Integrated management of pests and diseases

Each phase of cowpea attracts a number of insect pests and diseases. The major insect pests are *Aphid*, *Aphis craccivora*, Gram pod borer *Helicoverpa armigera*, Spotted pod borer *Maruca testulalis*, Leaf hopper *Empoasca kerri*, Pod bugs *Riptortus pedestris* and Whitefly *Bemisia tabaci*. Among these, aphid is a major economic pest of cowpea in Goa. The important diseases are root rot and damping off- *Pythium*, *Rhizoctonia* and *Macrophomina*, cowpea mosaic and Fusarium wilt *Fusarium oxysporum*.

1. Management of Aphids

Cowpea aphid, *Aphis craccivora* is a cosmopolitan species with a worldwide distribution; abundant in subtropical and tropical regions, and in the Mediterranean. It is one of the commonest aphid species found in the Goa region and causes considerable yield loss to farmers. Other aphids like *Aphis gossypi* and *Myzus persicae* also attack cowpea crop during rainy season.

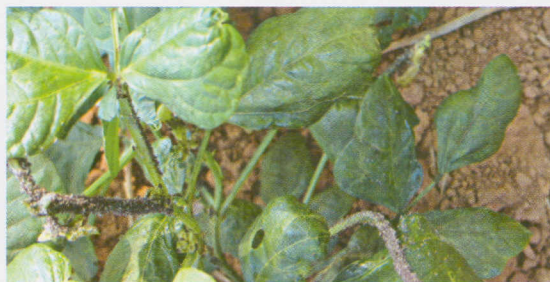
Host plants

Cowpea aphid *Aphis craccivora*

is mainly found on plants in the Leguminosae. It is a major economic pest of cowpea and groundnut, particularly in the tropics and a significant pest of mungbean (*Vigna radiata*), pigeonpea (*Cajanus cajan*), chickpea (*Cicer arietinum*), field and green beans (*Vicia* spp. and *Phaseolus* spp.), lupins (*Lupinus angustifolius*), lentil (*Lens esculenta*) and lucerne (*Medicago sativa*). It is also a minor pest on a range of other leguminous crops and also some non-leguminous crops, such as cotton and citrus. Crop losses caused by *Aphis craccivora* are due to direct feeding damage and to indirect damage, chiefly via the transmission of plant viruses.

Symptoms of damage

- Both adults and nymphs feed mostly on growing tips, young foliage and pods of mature plants by sucking the sap.
- Under heavy infestation, the plant becomes chlorotic and leaves curl.
- The infested plants become stunted, leading to leaf distortion, premature defoliation and death of seedlings.
- While feeding, this aphid produces a considerable amount of honeydew upon which sooty mould grows. The black sooty



Aphid infestation on cowpea



mould reduces the photosynthesis of plants.

- An indirect and generally more harmful effect, even of small populations, is the transmission of cowpea aphid-borne mosaic virus.

coating that makes them grey and dull.

- Nymphs and adults colonise on young stem, leaves, flowers and pods.
- Visit regularly and observe for the insect at borders in early stages.

Identification and Monitoring

- The adults are black and shiny, upto 2 mm long and some are winged.
- Nymphs are covered with waxy

Life cycle

- The insect passes through four nymphal instars before reaching adulthood.

- Under conditions of abundant good quality food and favourable climate, parthenogenetic apterous adult females are successively produced.
- Alate adults are produced whenever crowding occurs and food is in short supply as well as during dramatic temperature changes.
- The growth, development, fecundity and longevity of *Aphis craccivora* vary with weather conditions, soil fertility, soil moisture and host plant.

Management cultural control

- Grow different crops or grow them in rotation every cropping season. This practice provides food, shelter and it increases the number of natural enemies that prey on aphids.
- When transplanting, use aphid-free seedlings only, because often they are the source of infestation.
- Avoid using heavy doses of highly soluble nitrogen fertilizers.
- Control and kill ants.
- Clean cultivation.

Physical and mechanical control

- Spray a steady stream of water on the host plant to knock-off

aphids. Once on the ground, the fallen aphids are prey to ground predators and they have difficulty returning to the plant.

- Use yellow sticky traps. Aphids are attracted to yellow color.
- Handpicking and destruction of various insect stages and the affected plant parts.

Biological control

- Parasites and predators especially Coccinellids reduce the population of aphids considerably.
- Release of *Menochilus sexmaculata* @ 1250 / ha.
- Conserve bio-agents like flower bugs (Anthocorids), lady bird beetles (Coccinellids), praying mantids, hover flies (Syrphids), green lace wing (Chrysopids), long horned grass hoppers and spiders.

Chemical control

- Young crop may be applied with chlorpyrifos @ 2 ml / litre of water or dimethoate 30 EC @ 650 ml/ha in 600 litre of water.
- If the terminal buds are infested in the young crop, spray dimethoate @ 1 lit/ ha at 30 days after sowing.
- Apply NSKE 5% (neem seed kernel extract) to control the aphids.

2. Seedling diseases

Pre and post emergence seedling mortality is one of the important diseases observed in cowpea field. It is caused by *Pythium aphanidermatum*, *Rhizoctonia solani* and many other soil fungi.

Symptoms

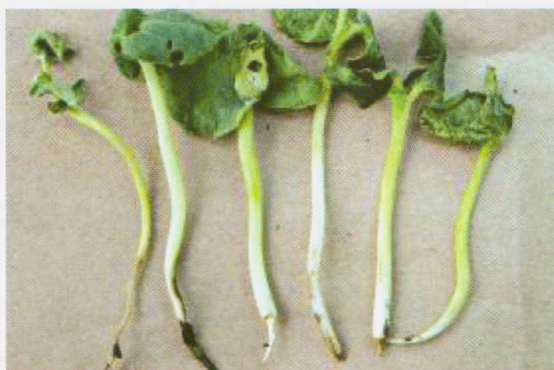
Seeds may rot before emergence from the soil and the young seedlings may die. In case of post emergence damping off, reddish brown lesions appear on collar region of hypocotyl followed by rapid death of young plants.

The lesion is limited to collar regions only in case of *Rhizoctonia*.

solani infection. However, in case of *Pythium aphanidermatum*, the lesion moves upwards and watery lesion cause collapse of seedlings.

Management

- Drain the field of excessive water.
- Seed treatment with *Trichoderma viride* @10g/kg or *Pseudomonas fluorescens* @ 10g/ kg of seed or carbendazim or thiram 2g/kg of seed.
- Spot drenching with carbendazim 1g/lit *Pseudomonas fluorescens* / *Trichoderma viride* 2.5 kg/ha with 50 kg FYM.
- Use pathogen free certified seeds.



Damping off

3. Foliar diseases

The common foliar diseases observed in cowpea are as follows:

Disease	Symptoms	Management
<i>Cercospora</i> leaf spot: <i>Cercospora canescens</i>	Rough, circular, cherry red to dark red spots on the upper leaf surface. The centre becomes silvery grey when spores are produced. In severe cases, defoliation occurs.	Destroy diseased debris. Use pathogen free seeds from healthy plants. Seed treatment with carbendazim or thiram @2g/kg of seeds. Spray mancozeb (0.2%) or carbendazim (0.2%) at fortnight interval.
<i>Septoria</i> leaf spot: <i>Septoria vignae</i>	Small, pinhead size, reddish brown, circular, water soaked scattered spots on both the surface of leaves. The spots rapidly enlarge to irregular lesions. Spots later turn light brown with dark brown margins.	Spray mancozeb (0.2%) or carbendazim (0.2%) at fortnight interval.
Brown rust: <i>Uromyces appendiculatus</i>	Minute, almost white, slightly raised pustules on the leaves. Plants with heavy rust infection appear to have brown tinge. Stunting and light green plants are observed.	Spray mancozeb (0.2%) or oxycarboxin (0.1%) at fortnight interval.



Cercospora leaf spot



Cowpea Rust

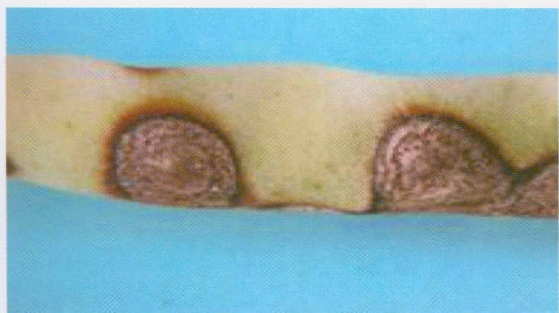


Septoria leaf spot

Anthracnose: *Colletotrichum lindemuthianum*

Symptoms:

Brown sunken lesions with dark red margins develop on the stems. Many lesions rapidly merge to girdle stems, branches, peduncles and petiole. Elongated lesions appear on the leaf veins and tannish red spots with yellow halo on the leaf surface. Lesions similar to those found on the stem also occur on pods. Severely affected pods are curled and do not contain normal size seeds.



Management

Crop rotation with non-host crops for 2-3 years.

Seed treatment with carbendazim or thiram @2g/kg of seeds.

Spraying of mancozeb (0.2%) or carbendazim (0.2%) at fortnight interval

Charcoal rot/ root rot

Macrophomina phaseolina

Symptoms

The seedlings remain stunted and some of them develop rot in the hypocotyls region and extend downwards. Roots also exhibit rotting and seedlings get dried.

In mature cowpea plants, greyish black sunken lesions appear on the lower stem and roots accumulate small black sclerotia. Sometimes stem girdle which may break longitudinally.



Root rot

Management

Crop rotation with non-host crops for 2-3 years.

Seed treatment with carbendazim or thiram @2g/kg of seeds.

Seed treatment with *Trichoderma* or other biocontrol agents @10g/kg of seeds and soil application of biocontrol agents along with organic manure.

Viral diseases-Cowpea mosaic diseases

Several viruses cause disease in cowpea. These viruses produce a mosaic pattern (intermixing of green and yellow patches) on leaves.

They may be found singularly or in combination with others.

They cause irregular light and dark green mosaic patterns on the leaves. Some viruses cause thickened, malformed and distorted leaves.

The mosaic patterns are best observed on the younger foliage. Plants may be stunted and fail to produce normal pods. If the disease attacks plants at the early growth stage, no pods should be expected. The most common virus disease is cowpea aphid-borne mosaic potyvirus. It is transmitted by aphids.

List of common viruses infecting cowpea are given below:

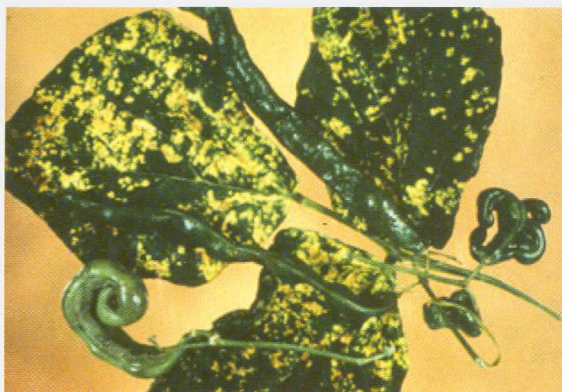
Virus	Characteristic symptoms	Vector
Cowpea mosaic virus	Mosaic	
Cowpea severe mosaic virus	Mosaic	Beetles
Cowpea yellow mosaic virus	Mosaic, leaf distortion, blistering, dwarfing and death of plants	Beetles
Cowpea aphid borne mosaic virus	Mosaic, mottling, green vein banding	Aphids
Cowpea golden mosaic	Chlorosis, leaf distortion, blistering	whitefly



Cowpea mosaic virus



Cowpea mosaic virus



Cowpea aphid borne mosaic virus



Cowpea aphid borne mosaic virus



Cowpea severe mosaic virus



Cowpea yellow mosaic virus

Management

Plant resistant varieties wherever available

Use disease- free healthy seeds

Crop rotation with non-legumes for 4-5 seasons

Remove the infected plants, weeds and alternate hosts at the first instance.

Management of vectors through insecticide spray.

Spray any one of the systemic insecticide like Chlorpyrifos @0.1% to control the vector.

Spray Metasystox @ 1 litre/hectare dissolved in 1000 litres of water to check the whitefly

V. Harvesting and threshing:

The crop matures in 100-110 days from the date of sowing. The pods are picked up as and when they show signs of maturity giving brown discoloration and gradual drying. Normally, three to four pickings are made.

The pods are then sundried for three to four days till they become brittle. The grain is separated by trampling the pods under feet or by use of wooden sticks.

Dry the seeds to reduce the moisture level below 10-12 per cent.

VI. Storage

Properly dried local cowpea is relatively more tolerant to the infestation of pulse beetle than small seeded cowpea varieties like C-152. The harvested grain is stored in airtight plastic containers which are not opened till the next season to maintain the moisture level and to ward off incidence of insect pests which is a major stored grain problem encountered by the growers.

Various methods of seed storage are used to protect the grain (pulse) from insect damage. Some of the common practices followed are use of neem leaves, use of castor/mustard oil, or finally crushed *Triphal* or even Boric acid powder @ 3-4g/kg is used in storage to protect from stored grain pests like Bruchids, etc.

Use of insecticide carbaryl @2.5 g/kg is more effective in inhibiting the pulse beetle attack without affecting the germination of the seeds.

Yield

Cowpea seed -1000 to 1500 kg / ha.

Haulm yield – 2.5 to 3.0 t/ha.

VII. Results of On Farm Trials and Front Line Demonstrations

The results of on farm trials and front line demonstrations taken up at Pilar, Goa Velha, Chodan, Taleigao in Goa suggest that “*Alsando* selection-1” with improved management practices can bring about increased productivity ranging between 250 kg to 400kg/ha over and above the farmer’s yield bringing in additional income between eight to fourteen thousand rupees.

The mean yield under on farm trial was found to be superior over the recommended practice (8.90q/ha) as well the traditional farmers practice (7.89q/ha) corresponding to an yield increase of 20.7% and 37.8%, respectively. The on farm trial resulted in a benefit cost ratio of 1:2.87 in the alternate practice as against 1:1.96 and 1:1.79 recorded in the recommended practice and farmers practice, respectively.

VIII. Economics of cultivation

The details of cost of cultivation/ha and the other economic details are presented in table below:

Economics of local cowpea cultivation in Goa

Sl. No	Particulars	Unit cost (Rs.)	Total cost/ha (Rs.)
1	Land preparation-one ploughing and one harrowing.	Hiring tractor @ Rs. 350/ hour	2500
2	Seeds and planting	40kg @ Rs. 80/kg	3200
3	Manures and fertilizers including their application	500g <i>Rhizobium</i> 25 kg N 50 kg P ₂ O ₅ 25 kg K ₂ O	750 2400
3	Intercultivation including weeding	Hoeing once -8 mandays Weeding -30 mandays	1600 4500
4	Plant protection including spraying cost	Once with chlorpyriphos @ 2ml/litre of water	800
5	Harvesting	20 women days	3000
6	Threshing, drying and packing	15 women days	2250
	Total cost (Rs/ha)		21,000

Returns:

Cowpea seed 1200 kg/ha @ Rs. 80/kg	=	96,000
Haulm yield-2.50 t/ha @ Rs. 2000/t	=	5, 000
Gross Returns (Rs./ha)	=	1,01, 000
Cost of cultivation (Rs./ha)	=	-21, 000
Net Returns (Rs./ha)	=	80, 000



भारत
ICAR



हर कदम, हर डगर

किसानों का हमसफर

भारतीय कृषि अनुसंधान परिषद

Agrisearch with a human touch