

Original Research Article

Elephant Foot Yam (*Amorphophallus paeoniifolius*): Money Spinning Tuber Crop for Doubling Farmers Income of Bihar

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ABSTRACT

Keywords

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An experiment was conducted under lab and field conditions during the year 2008-09 and 2009-10 for studying the management of *Alternaria* blight of Ashwagandha through fungicides, organic manure and biofertilizer. Maximum growth inhibition occurred in Carbendazim and Chlorothalonil after eight days (0.0 mm) at 500 ppm concentration *in vitro*. Minimum PDI of 5.0 and 5.4 was observed in Vitavax Power and Mancozeb *in vivo*. Maximum yield was recorded in Vitavax Power (7.48 q/ha) and Mancozeb (6.77 q/ha) followed by Chlorothalonil (5.75 q/ha). Evaluation of seven amendments of biofertilizers for management of disease under field conditions revealed that minimum PDI was observed in FYM and RDF + FYM. Maximum increase in yield was recorded in FYM followed by RDF + FYM.

Introduction

Elephant foot yam (*Amorphophallus paeoniifolius*) commonly known as “Ole” is an important tuber crop and was considered as subsidiary vegetable crop till a decade back in Bihar. Before 1990’s the farmers of Bihar never imagine for commercial cultivation of elephant yam. Only unnamed local cultivars with high acidity, more side tubers and poor in yield were grown in waste land or bushes and people in villages were used to consume the corms in the form of pickles. Introduction of non-irritant type cv. Gajendra from Andhra Pradesh under All India Coordinated Research Project on Tuber Crops (Other than Potato) and its subsequent release for commercial cultivation in Bihar in 1991 was considered a land mark in improvement of Tuber Crops. The farmers of North Bihar in

general and its five districts viz; Muzaffarpur, Samastipur, Vaishali, Begusarai and East Champaran in particular having well drained upland soils have taken up the cultivation on commercial scale. Now a days, it has replaced the cultivation of tobacco to a large extent which was considered to be the only cash crop a decade earlier. The farmers are earning a handsome amount (Rs. 2.50-3.0 lakh/ha) out of its cultivation and considered as *Money spinning crop*. It has brought economic security to the farmers and considered as a better means of improving livelihood of small and marginal farmers. Another attractive character of this variety is its non-acidity and excellent cooking quality with high yield potential (55 to 60 t/ha) which is significantly higher than many

of the commercial crops especially cereals grown in Bihar.

Distribution in Bihar

Amorphophallus is cultivated at commercial scale in the districts of Muzaffarpur, Samastipur, Vaishali, Begusarai and East Champaran of Agro-climatic Zone-I of Bihar. The soil of upland is mostly sandy loam to loam with good drainage facility. The average rainfall is about 1200mm during the growing period between June to end of September. The warm and humid climate favour wider leaf canopy of this crop. It is also spread in other districts of Bihar in smaller to larger area keeping in view of net profit obtained by the farmers.\

Materials and Methods

Time of planting, seed size and spacing

In Bihar, *Amorphophallus* is planted from end of February to May depending on the availability of vacant land and soil moisture. But in changing scenario the most appropriate time of planting is April. Pre planting irrigation is recommended in case of moisture stress for early and uniform sprouting of planting material. Seed size of 0.5 kg of whole corm or cut pieces at a row and plant spacing of 75 cm has been recommended for commercial cultivation while 100 g seed corm is required for seed production at a row and plant spacing of 50 cm each.

Method of planting

Pits of 30 cm each in length, width and depth are opened. Well rotten compost or vermicompost alongwith NPK in inorganic form, neem or mustard cake are mixed with soil. After putting the seed corm in vertical position it is covered with soil upto 15 cm

above ground level in pyramid shape to avoid rotting of corm in case of water logging.

Manurial schedule

Farmers of Bihar are generally following the recommendation of manurial scheduled of 15t compost + 200 kg neem/mustard cake or 200 kg vermicompost alongwith 80:60:80 kg NPK/ha for obtaining good commercial crop. Well decomposed compost of FYM and neem-cake should be applied at the time of last ploughing. Among the chemical fertilizers, full dose of P and one third of N and K are to be applied at the time of planting. The remaining dose of N and K are applied at 70 and 90 days after planting just after weeding followed by earthing up.

Corm treatment

The farmers generally treated the seed corm in cow dung slurry with *Trichoderma viridi* @ 5 g or Mancozeb @ 2 g/kg seed corm. The planting material should be dipped in solution for half an hour and then treated corm should be dried in shade for 15-20 minutes before planting. The corm treatment has been found effective in reducing the disease incidence caused by soil pathogen and enhancing early sprouting.

Intercropping in *Amorphophallus*

Amorphophallus is grown as sole crop and intercrop with different crops. Different crops such as pulses (green gram, black gram, lentil), vegetables (okra, cowpea, pumpkin, bottle gourd, melons), maize and oilseed (mustard, sesamum, sunflower) are grown as intercrop for the best utilization of interspace left over between rows and plants at the time of planting and crop maturity. It has also been proved to be a profitable intercrop grown in newly planted

litchi/mango orchards which helps in proper utilization of inter row space towards generation of additional income. The farmers have adopted it as a viable technology. Since the elephant foot yam takes not less than 25-30 days to complete sprouting after planting. The intercrops viz; moong, urd, cowpea, okra, cucumber etc are grown successfully during March-April and harvested within 90-120 days. Some of the farmers also have started to grow bottle gourd and spread the foliage above the main crop (*Amorphophallus*) on the wire nets supported by bamboo. The highest net return (1.80 lakh/ha) was obtained when cucumber or bottle gourd was grown as intercrop followed by lady's finger.

The canopy of crop dries during October-November leaving the plot without foliage and corms within the soil. The corm is harvested in the month of February to mid March for use as planting material for next crop. These 4-5 months are utilized by the farmers to grow another set of intercrops like vegetable pea, coriander for sauce, lentil, toria and radish. These are short duration crops and require only one light irrigation. These intercrops require only preparation of interspaces by spade and use of half dose of fertilizers and spraying of urea (2%) in order to boost growth. By adopting such technology farmers not only generate good income but some of them give additional return after compensating the entire cost of cultivation incurred on main crop. Among these crops, coriander for sauce is most remunerative giving net return of Rs.1.0 lakh/ha followed by pea, radish, lentil, palak and toria.

Cropping sequence

Farmers started harvesting of immature *Amorphophallus* corms during September-October purely for vegetable purpose due to

obtaining higher price in the market (15-20 kg/ha). Rapeseed and mustard, winter maize, pea, wheat, lentil, cauliflower, and potato are also taken depending upon moisture, soil type and ultimately enhance the socio economic condition of the farmers. Green gram, black gram, okra, cowpea, maize etc are grown after the harvest of corm for seed purpose during February-March.

***Amorphophallus*: Intercrop in litchi and mango orchard**

In order to utilize the Inter row space of newly planted litchi and mango orchards Sweet potato, *Amorphophallus*, *Colocasia* (Taro) and turmeric were evaluated as intercrops at Dholi centre of AICRP on Tuber crops. *Amorphophallus* was found to be most remunerative generating additional income of Rs. 1.5 to 2.0 lakh/ha depending on the age of orchard. More income could be generated from newly planted orchard in comparison to older ones.

It has been also found that there was marked improvement in the bearing of the orchard due to different cultural operations, fertigation and irrigation provided to the intercrops. The farmers of North Bihar have widely accepted the technology and getting handsome profits by utilizing the interspaces of newly planted orchards as well as old orchard upto 10-12 years.

Disease and pest management

Collar rot and leaf blight are two major diseases which cause serious damage to the crop. Excessive rainfall, water logging coupled with high humidity and temperature are positively associated with the intensity of diseases. Mosaic disease caused by virus has been also observed in the field to some extent but not in serious form. An integrated disease management package has been

developed by Dholi centre consisting of use of healthy planting material, corm treatment in cowdung slurry mixed with *Trichoderma viridi* @ 5 g/kg corm or Mancozeb (0.2%) alongwith soil application of neem cake @ 250 g/pit followed by one foliar spray with neem gold @ 0.5% at 60 days after planting and regular removal and destruction of mosaic affected plants from the field. These treatments take care of the incidence of diseases to a greater extent. The farmers are well acquainted of these treatments. The attack of insect pests do not play any major role in adversely affecting the growth, development and yield.

Harvesting

The farmers start harvesting of commercial crop after 6 to 7 months depending upon the market demand. But the crop raised for seed purpose should be harvested at maturity of the plants after 9 to 10 months with the help of spade. After harvesting, soil and root should be removed and dried in shade for three to four days. Only healthy corms should be stored separately on wooden platform or racks in well ventilated rooms. In Bihar there is no problem of storage because farmers start harvesting of seed crop after harvesting of intercrops particularly during last week of February to mid March. After a fortnight interval they start planting. Hence, there is minimum chance of post harvest losses.

Marketing

Most of the farmers sell their standing crop to village merchants or local traders at the rate of Rs. 2.0 to 2.5 lakhs/ha. The selling price depends on crop vigour and per se estimation of yield. After harvesting the crop the village merchants or local traders transport these corms to different cities of Eastern and Southern part of Bihar and

adjoining states. Small and marginal farmers sell their produce to commission mandis at higher price. Small farmers who produced 0.5 to 1.0 t of corm are selling in local mandis at the rate of Rs.15-20 per kg. Farmers who took up this crop initially were wise enough to establish linkages with traders and business people of big market in the metropolitan cities. Such assured market linkages helped other farmers to take up this crop and the message of being a most remunerative crop spread to almost all districts of Bihar and now a days, farmers of almost all districts of Bihar started cultivation of *Amorphophallus* in smaller to larger area.

***Amorphophallus*: A money spinning crop for common farmers**

In general, *Amorphophallus* is grown in wide range of soil and climatic conditions by the farmers of different socio-economic group. Landless labourers grow about 100-150 plants around their homestead land and earn Rs. 8000-10000 by selling its corm in local market. Members belonging to BPL or self help group take land on contract from land lords and grow *Amorphophallus* for their livelihood. This crop provides financial support to the farmers at the time when it is needed most i.e. during September-October. They earn enough money for cultivation of future Rabi crops and celebrated different festival such as Durga Puja, Diwali, Chhat etc. falls during September-November. It also compensates loss of kharif crops due to flood or drought, which have become a recurrent feature in North Bihar.

Formation of *Amorphophallus* growers cooperative society

For the first time in India Elephant foot yam Growers Cooperative Society was launched under the aegis of ATMA, Government of

Bihar, on the sole initiative of scientists of AICRP on Tuber Crops, Dholi centre. The registered farmers were trained by the scientists working at Dholi upto six months and started seed production programme directly under the supervision of Tuber scientists. Now a days, they established themselves as a biggest supplier of *Amorphophallus* planting material to U.P., West Bengal, Andhra Pradesh, Kerala, Tamilnadu, Chhatisgarh and other states. The Central Tuber Crops Research Institute, Thiruvananthapuram (Kerala) has purchased 60 t of planting material of *Amorphophallus* from the Farmer's Cooperative Society, which probably will be a curtain raiser for

many such offers to come from different parts of the country. Dholi centre of AICRP on Tuber Crops has already supplied quality planting material of *Amorphophallus* with the help of this society to Kerala, CTCRI, Thiruvananthapuram, Assam Agril. University Jorhat (Assam), Birsa Agril. University Ranchi, Jharkhand, ICAR Research Complex, Barapani (Meghalaya), ICAR Research Complex, Patna, ATMA, Agril, Deptt. Govt. of Bihar, NGO/s and different KVKs as well as farmers of Bihar and other states. Therefore, it is a fact that elephant foot yam farmers of Bihar are all set for a rich harvest.







***Amorphophallus*: A eco-friendly crop**

Amorphophallus is grown mostly as rainfed crop in North Bihar. There are least expenditure incurred on irrigation and fungicides. Insecticides are seldom used to control insect pests. There is nothing like any environmental pollution. Use of treated seeds as corms is mostly used to take care of the disease problem. The growth, development and yield is not adversely affected due to climate change unlike other crop like cereals, pulses and oilseeds etc. The pseudostem and leaves are used as green manure and fodder for cattle, respectively.

References

High biological efficiency coupled with

highest per day production of dry matter, high yield and better price play vital role in making the crop useful for economic security and making the life of farmers more easy and comfortable. Therefore, now a days Elephant foot yam is considered as money spinning crop and helpful in doubling farmers income in changing climatic situations.

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