



Diara Farming of Cucurbits

Shiwani Gupta¹, *Dhirendra Rajpoot² and Mahima Sanodiya³

¹M.Sc. Research Scholar, Department of Vegetable Science, VCSG Uttarakhand University of Horticulture and Forestry, Bharsar, Pauri, Garhwal, Uttarakhand

²PhD Research Scholar of Department of Fruit Science, Chandra Shekhar Azad University of Agriculture and Technology, Kanpur-208002, Uttar Pradesh

³PhD Research Scholar of Division of Vegetable Science, ICAR- Indian Agriculture Research Institute, New Delhi

*Corresponding Author's email: dhirendra1821rajput@gmail.com

There is currently relatively little opportunity for horizontal land cultivation due to increases in the population. Different Indian states might adopt a type of vegetable forcing called as diara bed cultivation. Cucurbitaceous vegetables are grown in the diara land farming increases their off-season yield. The riverbed cultivation is an effective way to cultivate the cucurbits and other high-value crops like tomatoes because of their deep root systems. Total area under for the cultivation of cucurbits is 60%. Diara is utilized to grow the cucurbits crops viz; cucumbers, watermelons, muskmelon, *luffa* and pointed gourds on the medium-land mainland. Pointed gourds also grown on the upland diara.

Introduction

Diara land farming or riverbed cultivation possibly started during Mughal period, growing vegetables on the river side when flood level becomes less intense. Diara land cultivation, primarily used for cucurbits (like Gourds, Melons, Squash and Cucumber). The South-Asian countries and North-Western India are mainly grown as off season. There are several local name of Diara land depending on the region, such as Riverbed, Khadar lands, Char lands, Dariayi, Doab, Kochar, Kachhar, Nad, Nadari, Riverine area as well as Tali lands. Diara land refers to areas formed by the river sedimentation or along river and fertile. Diara word comes to “Diyas” meaning earthen lamp i.e., bowl like system on the either side of the river look like small *Diyas* when rain water gets accumulated during rainy season. Some important areas where cucurbits like Cucumber, Bitter gourd, Long melon, Sponge gourd, Watermelon, Musk melon, Bottle gourd, Pumpkin, etc. are extensively grown. It is observed that the total area of cucurbits cultivation 60% under riverbeds. During the summer season around 75 - 80% of total cucurbits production is being produced in riverbeds, which is available in market from February – June and October – January, respectively.

The main riverbeds for Diara cultivation in India

States	River beds
Uttar Pradesh	Ganga, Yamuna, Ramganga, Hindon, Sarayu, Ghaghra, Tank beds, Sharada, Gomati etc.
Madhya Pradesh	Tapti, Tawa, Narmada, Mohana,
Bihar	Ganga, Kosi, Gandak, Sone, Burhi Ganga
Rajasthan	Banas, MarkhedaGhat
Maharashtra	Tapti, Burai, Purna, Vagur, Girna, MaisBhuikund, Nirguna, Kanchan
Andhra Pradesh	Krishna, Pennar, Tungbhadra, Papagni, Hundri-Sagileru

Gujarat	Sabarmati, Tapti, Vatrak, Panam-Orusung,
Kerala	Manimala, Pamba
Karnataka	Channapatna, Hanganoor, Shimsha

Types of Diara cultivation

- **Riverbank Diara-** The strips of land for cultivation in between riverbeds and natural levees or existing.
- **Riverbed Diara-** During non-monsoon season that the land available for cultivation on both sides of the following portion of the riverbed.
- **Flood prone Diara-** The both side area beyond the levees or embankments of the river.
- **Flood affected Diara-** The land for cultivation adjacent to unprotected which is prone to flooding.

Classification of Diara land based on precise location from the main stream

1. **Main riverbed (Low land) Diara-** Cultivation of vegetable crops during non-monsoon seasons *i.e.*, December-June. Bottle gourd and Bitter gourd is main crops.
2. **Main land (Medium land) Diara-** Mostly cultivated on beds of river. Main crop grown is Cucumber, Watermelon, Muskmelon, *Luffa* and Pointed gourd etc.
3. **Upland Diara-** The area have been elevated due to continuous deposition occurs less flood. The area is not very different from non-Diara lands. Pointed gourd is main crop for upland diara cultivation.

Advantages of Diara cultivation

- ❖ Early and high yield with ease in irrigation.
- ❖ High net returns per unit area.
- ❖ Cost of cultivation is low due to fertile lands.
- ❖ Highly fertile land reduces the external mineral requirements.
- ❖ Very limited scale weeds growth.
- ❖ Easily to control the biotic factors through the cultural practices.
- ❖ To adapt the climate change.
- ❖ Low cast labour facilitates.

Improved cultivars grown in riverbed cultivation

The Cucurbits are major crops that can grown on the riverbed such as Pointed gourd, Water melon, Bottle gourd, Cucumber, Summer squash, Bitter gourd, Pumpkin, Sponge gourd etc. have been developed by various research institutes but they adopted in Diara land. In some other crops are grown on the riverbed cultivation such as Beans, Chilies, Tomato and other vegetables crops.

Cultural Practices

Site selection and Land preparation

To choose the right sites for successful cucurbits cultivation. A well-drained loamy soil is more desirable for cucurbits. Lighter soils which warm quickly in springs are usually utilized for early yields and in heavier soils vine growth will be more and fruit late in maturity. In summer soil should not be cracked and in rainy season should not be waterlogged condition. The long tap root system is adapted to growth of cucurbits in riverbeds. The cucurbits prefer a soil pH between 6.0 to 7.0 but Musk melon does not tolerant to acidic soil.

Land Preparation

Most of farmers select areas along the riverbed where the river flow will be perpendicular to their fields. After recession of flood during October-November and the cessation of the South- West monsoon, pits or trenches or channels are prepared.

Soil Temperature

For the proper growth and development the minimum temperature should be below 10°C and maximum of 25°C. The optimum temperature range should be around 18-22°C, the soil temperature is also a determining factor for quick germination, early maturity and production.

System of Planting

Mostly the farmers choose the following systems of planting depending on his personal performance and availability of labor. There are mentioned under here -

1. Pit system of planting
2. Ditch system of planting

1. Pit system of planting

For the pit system, pit of 0.5m diameter are dug 1m deep and 1-3 m. apart depending on the crops and planted with numerous seeds, the feeble of which are thinned out. Sometimes circular pits with diameter of about 3.5- 4.5m and a depth of 90cm are prepared.

2. Ditch system of planting

To achieve the availability of moisture and higher temperature, the trenches are dug in North-West direction, To use the ditch system, a trench 1m deep is dug along row, with 1 to 2m (Cucumber, Bitter gourd) or 3m (Watermelon, Bottle gourd, Pumpkin) space between rows. Seeds are planted spaced 1m (Water melon, Bottle gourd, Pumpkin) and 0.5m (Cucumber, Bitter gourd) apart in the ditch. The pits or trenches are filled with organic decomposed waste or oilcake or FYM or any other which is mix in the soil.

Some Crops and their Varieties are grown in Diara

Cucumber (*Cucumis sativus*)- Cucumber cultivars are usually classified on the basis of how they are used, fresh market (slicer) and pickling. Cultivars and have a uniform cylindrical shape. Some of important cultivars are - Japanese Long Green, Pusa Sanyong (F₁ hybrid) etc.

Musk melon (*Cucumis melo*)- The species of *Cucumis* genus are large polymorphic type comprising a large number of botanical and horticultural varieties or groups like., Arka Jeet, Arka Rajhans, Pusa Madhuras

Water melon- The important varieties of water melon are mentioned- Improved Shipper, Asahi Yamato, Sugar Baby and Durgapur Meetha.

Seed treatment, Seed rate and Seedling or Transplanting

The seed rate differs depending on the crops like cucumber requires 2.5–3.0 kg, bitter gourd 5.0–6.0 kg, bottle gourd 3.0–6.0 kg, sponge gourd 4.0–5.0 kg, and ridge gourd 3.5 5.0 kg per hectare. Seeds are typically sown early, during the first or second week of November, sometimes extending to the first week of December. Late sowing occurs in the first week of January. Seeds are planted in trenches spaced 45-60 cm apart at a depth of 3-4 cm, with two seeds sown per spot. In colder temperatures, pre-sprouted seeds are used to ensure better germination; these are soaked for 24 hours, then kept moist in a gunny bag or covered with cotton cloth in a warm place for about a week. Seedling are transplant ideally at the 2-4 leaf stage, using 3-4 pre-germinated seeds per pit.

Manure and Fertilizer

For soil fertility, well-decomposed farmyard manure or compost, along with organic cakes like castor, groundnut, or neem, are applied initially. To improve moisture retention, river silt is often added. During thinning, urea is applied at 30-60 kg per pit. After 25-30 days, based on weather and crop growth, chemical fertilizers, particularly nitrogenous types like urea, are top-dressed in two split doses.

Irrigation

Cucurbits have a deep root system that helps them tolerate Diara land conditions. Irrigation is usually done by pitcher or left to natural water availability, though sprinkler or drip irrigation systems can be beneficial, especially in sandy soils where water management is crucial.

Thatch Preparation

In North-West India, when winter temperatures drop to 1-2°C during December and January, young plants need protection from frost and cold. This is achieved using a thatch screen made from locally sourced materials such as paddy straw, saccharum grass, or sugarcane leaves. In February, grass is also used as mulch to shield young plants and fruits from the heat of the sand and to prevent vine displacement during strong winds.

Weed Management

Weeds like *Polygonum* species and *Euphorbia* are common in Diara areas and are controlled manually due to the loose sandy soil. Weedicides are avoided to prevent contamination of river water, which could harm humans, animals, and aquatic life.

Harvesting and Yield

Fruits should be harvested while tender and edible, typically every 2-3 days. Harvesting can continue from late June to October, with early yields starting in February-March, which can provide higher returns. After harvesting, crops are taken to local markets for sale.

Crop duration and yield of cucurbitaceous vegetables in Diara

S.No.	Vegetables	Planting Time	Harvesting Time	Average Yield (q/ha)
1	Pointed gourd	Nov-Dec	March- July	350-400
2	Cucumber	Jan- Feb	March-June	225-250
3	Bottle gourd	Nov-Dec	March-July	200-350
4	Ridge gourd	Apr- May	June-July	100-200
5	Sponge gourd	Jan- Feb	April- May	100-200
6	Bitter gourd	Feb-March	May-July	100-150

Role of Pollinators

Cucurbit crops are highly cross-pollinated, and pollinators have an impact on crop productivity. The primary pollinator of cucurbit crops is honey bees, because of the dry weather and the crop lying on the ground, honeybees are unable to see the flowers in Diara Land. Hence, sunflower sowing 100-150 plants per hectare was done for better pollination.

Disease and pests

S. No	Disease	Caused by	Scientific name
1	Downy mildew	Fungi	<i>Pseudo peronospora cubensis</i>
2	Powdery mildew	Fungi	<i>Erysiphe cichoracearum</i>
3	Fusarium Wilt	Fungi	<i>Fusarium oxysporum</i> f.sp. <i>melonis</i> (attacks water melon)
4	Vascular Wilt	Bacteria	<i>Erwinia tracheiphil</i> (rod-shaped bacteria)
5	Mosaic	Virus	PRSV/CMV

Insects

S. No	Insect pest	Scientific name
1	Red pumpkin beetle	<i>Aulacophora foveicollis</i> (Red colour beetle)
2	Fruit fly	<i>Bactrocera cucurbitae</i> or <i>Bactrocera dorsalis</i>
3	Leaf miner	<i>Liriomyza trifolii</i>
4	Aphids	<i>Aphis gossypol</i> (melon aphid), <i>Myzus persicae</i> (peach aphid)

Mineral Deficiencias

In certain situations, non-pathogenic disorders that are primarily brought on by mineral shortages are also common. This issue is unique to riverbeds. Deficits of macro and micronutrients can occasionally result from the leaching of nutrients caused by the sandy substrate and the absence of rich subsoil, silt, or alluvium beneath the sandy layer.

Conclusion

Diara cultivation is an agricultural approach that offers both benefits and problems on lush riverbank grounds. For the local food security and economic stability, Diara farming is however essential despite these obstacles, particularly for small and marginal farmers. In addition to raising household income, riverbed farming can help India's landless population's food security. While diara cultivation offers advantages, sustainable practices are needed to mitigate the risks associated with flooding and erosion. This includes proper water management, soil conservation and the use of appropriate crop varieties.

References

1. Bose, T. K. and Som, M. G. (Eds.). 1986. *Vegetable crops in India*. Naya Prokash.
2. Swarup, V. (2006). *Vegetable science and technology in India*. Kalyani Publ., New Delhi.
3. Thamburaj, S. and Singh, N. (Eds.). 2004. *Vegetables, tuber crops and spices*. ICAR.