



Performance of colocasia in hot arid region of western Rajasthan

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(Received: 07.04.2020; Accepted: 12.06.2020)

Abstract

The present study was conducted to evaluate the performance of colocasia under full shade, partial shade and open conditions of hot arid region of western Rajasthan. Result revealed that the vegetative growth characteristics *i.e.* plant height (31.20 cm), numbers of leaves/plant (2.70), leave length (21.60 cm) and leave width (20.20 cm) and yield attributes and quality attributes like dry matter percentage were recorded highest when colocasia was grown under aonla plantation (8 x 8 m) followed by colocasia grown under 100% shade condition and lower yield was observed under open conditions. Maximum numbers of cormels/plant (5.60), corm length (6.20 cm), corm diameter (9.20 cm), average corm weight (32.00 g), cormel length (4.30 mm), cormel diameter (8.10 mm) and cormel weight (18.90 g) were recorded when colocasia was grown in aonla plantation followed by colocasia grown under fully shade condition and lower values for yield attributes of colocasia was recorded under open field condition in the arid region.

Key words: *Colocasia esculenta* L., open condition, shade condition, yield attributes

Introduction

Colocasia (*Colocasia esculenta* L. Schott) is an important staple food crop grown throughout many Pacific island countries, parts of Africa, Asia and the Caribbean for its fleshy corms and nutritious leaves. The corm is an excellent source of carbohydrate, the majority being starch of which 17-28% is amylose, and the remaining is amylopectin. All parts of the colocasia are consumed, *viz.*, the leaves, petioles, corm and cormels used for curry preparation, corms utilized for snacks, baby feed, pig feed, *etc.* Colocasia (Taro) is thought to have originated in North Eastern India and Asia (Kuruvilla and Singh, 1981; Ivancic, 1992; Kolchar, 2006). Globally, it is grown in an area of 1.60 million ha producing 11.66 million t with an average productivity of 7.25 t/ha (FAO, 2009) and gradually spread worldwide by settlers. It is widely grown as a rainfed crop in the valley and *Jhum* area in entire North Eastern States of India. In Rajasthan, it is an important bulbous crop grown by both tribals and non-tribal populations. Previously it was grown in surroundings of major cities and National Capital Territory region of the state. However, due to the industrialization and urbanization, its area was reduced in these places (Alwar, Bharatpur and Jaipur region). At present, colocasia is the choicest tuber crop in *Hadoti* region *i.e.* eastern Rajasthan in Jhalawar, Kota, Bundi, Baran districts (Rathore *et al.*, 2016).

In the last few years, area under fruit crops has increased drastically in the state. Tuber crops are most suitable for intercrop in the fruit orchards. Colocasia are recommended as intercrop in new as well as old orchards. Rajasthan state is having highest rainfall variation in the country. It experience drought in every three years. Temperature also varied very

much, in summers temperature reaches as much as 47-48°C and in winters it is around -1 to -3°C. Frost is also occurred during severe winter. Extreme weather conditions can adversely affect corm production. The information regarding growing of colocasia crop is very scanty for arid region. To improve the yield and quality of colocasia, there is a need to standardize the conditions of growing in the arid region. Therefore, the present investigation has been carried out to study the response of the colocasia crop to full shade, partially shade and open field conditions.

Materials and Methods

The present investigation was conducted at ICAR-CIAH, Bikaner from 2017-2018 under aonla based cropping system (8 x 8 m) conditions as well as open condition (Fig. 1). The climate of the region is hot arid with a maximum temperature range from 39 to 45° C during May-June and minimum from subzero to 20° C during December-January. The average rainfall of Bikaner is 250 mm (average of 1998 to 2016) and most of rainy days occur during July to September with high evapo-transpiration that ranges from 1500 to 2000 mm per year.

Colocasia cv. local procured from the All India Coordinated Research Project on Tuber Crops Centre at MPUAT, Udaipur, was used for the study. The soil type is sandy texture and neutral to saline in reaction (pH 8.2). The experiment was carried out under three conditions *i.e.* between aonla plantation (8 x 8 m), fully shade condition and open condition with six replications under Randomized Complete Block Design. The sprouted cormels were planted at 45 x 45 cm spacing. After a month, gap filling was done for

maintaining uniform plant stand. Subsequent irrigations, weeding, intercultural operations and suitable plant protection measures were employed as and when required as per the recommended package of practices. Vermicompost @ 1.5 t/ha and NPK @ 80:60:80 kg/ha were applied. Phosphorus was given as basal dose. Nitrogen and potash were applied in four equal splits at 3rd, 4th, 5th and 6th months after planting. The observations were recorded for growth, yield and quality related traits.

Results and Discussion

The observations for growth and yield related traits were recorded like petiole length (cm), number of petioles, number of side shoots, number of cormels and yield per plant, length (cm), diameter (cm) and weight (g) of corm and cormels and yield (t/ha) (Table 1 to 3). The dry matter (%) was estimated based on fresh and dry weight basis. Maximum plant height (31.20 cm), numbers of leaves (2.70), leaf length (21.60 cm) and leaf width (20.20 cm) were recorded when colocasia was planted between aonla plantation (8 x 8 m) followed by colocasia grown under fully shade condition (31.10 cm, 2.50, 17.40 cm and 13.10 cm) and minimum was recorded when colocasia grown under open field condition (12.50 cm, 1.10, 7.00 cm and 5.30 cm). Colocasia are heavy feeders and for best performance required organic fertilizers and rich organic soil with plenty of composted material. A pH from 5.5 to 7.5 is found suitable for colocasia. Most colocasia prefer bright sunlight, unless grown in extremely hot, low humidity climates, where some light shade was necessary as reported by Cao and Long (2003), Long and Liu (2001), Misra *et al.* (2005), Tao *et al.* (2004) and Whitney *et al.* (1939).

Similar trends were observed for yield attributes of colocasia in the arid region. Higher value of numbers of cormels/plant (5.60), corm length (6.20 cm), corm diameter (9.20 cm), average corm weight (32.00 g), cormel length (4.30 mm), cormel diameter (8.10 mm) and cormel weight (18.90 g) followed by colocasia grown under fully shade condition and lowest yield attributes of colocasia were recorded in the arid was recorded under open field condition (Table 1).

Yield and quality of colocasia in the arid region varied significantly in different growing condition. Higher value of numbers of corms/plant, yield/plant (g), yield (t/ha) and dry matter (%) were obtained in partially shade condition followed by full shade condition and minimum was obtained under open field condition (Table 3). Crop when grown in open condition there is lower leaf number, leaf area index, chlorophyll content, dry matter accumulation, bulking rate, yield as compared to shade. Shade levels favoured for obtaining higher dry matter (Kumar and Jayachandran, 2003). It suggested that canopy temperature around the crop have been reduced by shading and this favours improved growth of colocasia in partial shade condition.

From the present study, it can be concluded that there is a good scope for cultivation of colocasia in hot arid region of north-western Rajasthan as intercrop in orchard. If good quality planting material and micro-irrigation facilities are made available, definitely the prospect of colocasia will be bright in this region as an intercrop with drip irrigation which enables high frequency application of water in and around root zone of the plants. This micro-irrigation methods of irrigation/fertigation economize on water (about 40-70% saving) at the same time giving 20-35 higher yield with up to 30-35% saving on fertilizers.

Table 1. Growth attributes of colocasia in the arid region at 45 days after planting

Growing conditions	Plant height (cm)	Numbers of leaves	Leaf length (cm)	Leaf width (cm)
Between aonla plantation (8x8m)	31.20	2.70	21.60	20.20
Grown under fully shade condition	31.10	2.50	17.40	13.10
Open field condition	12.50	1.10	7.00	5.30
Mean	24.90	2.10	15.30	12.80
CD at 5%	6.14	0.98	4.89	3.84

Table 2. Performance of yield attributes of colocasia in the arid region

Colocasia grown in different conditions	Number of cormels/plant	Corm length (cm)	Corm diameter (cm)	Corm weight (g)	Cormel length (mm)	Cormel diameter (mm)	Cormel weight (g)
Between aonla plantation (8x8 m)	5.60	6.20	9.20	32.00	4.30	8.10	18.90
Grown under fully shade condition	3.40	3.70	5.50	19.20	2.60	4.90	11.30
Open field condition	1.30	1.50	2.20	7.70	1.00	1.90	4.50
Mean	3.40	3.80	5.60	19.60	2.60	5.00	11.60

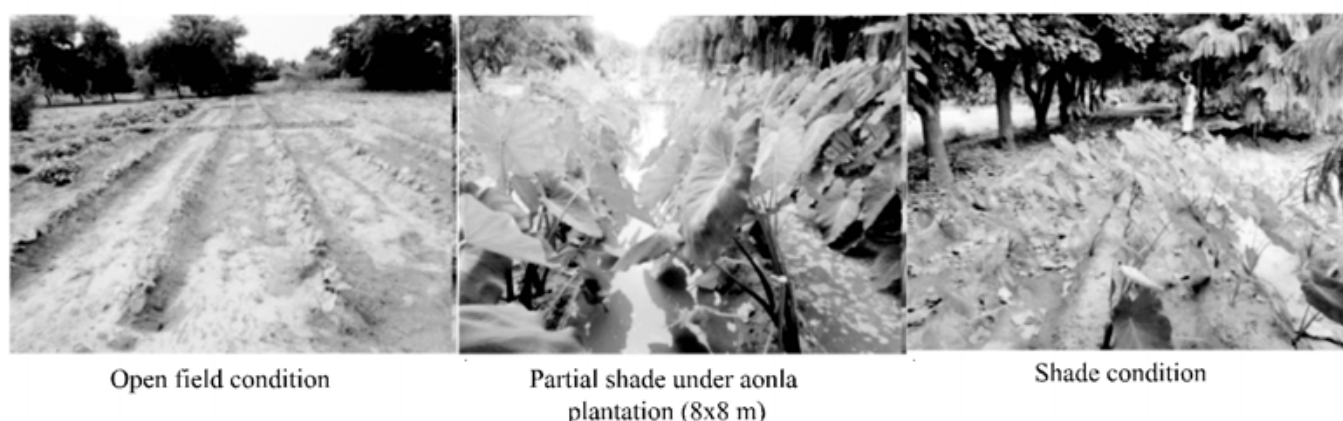


Fig. 1. Colocasia performance under different growing conditions

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