

Effect of SRI method for rice cultivation and drip irrigation - A low cost treatment for cultivation of strawberry

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ABSTRACT : Rice is the most popular and important crop in the world. It is widely grown through the temperate zone and in some tropical and sub-tropical areas of moderate to high rainfall. The rice production in India in a year 2011 - 2012 was about 105.31million tonnes/bales. The study was carried out at Akola Taluka, District Ahmadnagar, Maharashtra. Systematic rice intensification (SRI) technique was used for the comparison of yields of traditional rice cultivation and of SRI method. Soil type was sandy clay and sandy loam which was fertigated by organic fertilizer like cow dung with suitable proportions. 10 different plots were selected for eight different local varieties of rice such as Rupali, Punam, Indrayani, Pusa Basmati, Dapptari, Rasge, Lakshmi and Vaishnavi. Rice seeds were treated with *Amrut Pani*, for sprouting and *Jivamrute* for fungal diseases. The plant spacing 25 × 25 cm showed good result in increasing the number of tillers. The number of tillers increased (50-55 %) in each variety. The yield of rice was nearly increased (40 %), there was increased in yield by using SRI technique than traditional practicing. Gravity drip irrigation system a low cost water treatment technology for the farmers those have less land is available for the cultivation. The Sweet charley variety of strawberry was used for the evaluation of the gravity drip irrigation system. The average crop yield of strawberry per plant in one season was 1025 g.

Key Words : Systematic rice intensification, Gravity drip irrigation system, Sweet charley strawberry

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Rice is the most popular and important crop in the world. It is widely grown through the temperate zone and in some tropical and sub-tropical areas of moderate to high rainfall. It can be grown on a variety of soils ranging from sandy to heavy clay, for higher production fertile and well drained loam to clay loam soil is most suitable. The rice production in India in a year 2011 - 2012 was about 105.31million tonnes/bales (Directorate of Economics and Statistics, Ministry of Agriculture).

The study was carried out at Akola Taluka, District Ahmadnagar, Maharashtra. The average rainfall in the area is 861 mm creating high values for agricultural crops by using low water inputs and high fertilizer efficiencies is one of the methods used in addressing the environmental and resources problems. Control run off and protecting organic cultivation techniques including systematic rice intensification (SRI) method provide optimum environmental medium for better crop

growth in order to gain maximum yield and high quality products. These require comparatively less water as well as intercultural operation under the control run off and excess water remove though drain by place drainage structure on resulting in increased land productivity and facilitate year round production of crops. Rice seed are treated with *Amrut Pani*, for sprouting and *Jivamrute* for fungal diseases.

With wide spacing each plant gets more space, air and sunlight. As a result each plant gives more tillers. The roots would grow healthy and extensively and take more nutrients. As the plant is strong and healthy, the number of tillers would be more. The panicle length would be more. The panicle has more number of grains and the grain weight would also be more.

The concept of gravity drip irrigation has developed with the purpose to provide the most economical solution for small scale growers. Proper operation of the system will result in

higher yields, save water and energy and provide a simple fertilizer application. In Akola 73 per cent house-holds have less than 2 ha agriculture land and topography in these villages is a hilly terrain so through the farm pond irrigation is possible, these villages have developed the demo-plot for study the irrigation practice. Farm pond store the rain water and diverted to storage tank and tank purpose to mixing various water soluble fertilizer application and moderate the pressure into a system during the period of the irrigation various horticulture and vegetable cropping pattern are adopted and organic fertilizer used. Strawberry named Sweet charley was cultivated at Akola. This variety of strawberry can easily adapt at slightly warm climate. Also it require less amount of water And give good result in production.

The objectives of the study was to evaluate the SRI method for the rice and the performance of gravity drip irrigation system, a low cost irrigation method.

RESEARCH PROCEDURE

For achieving the mentioned objectives, the study was carried out in Akola village.

Experimental site :

The present investigation was conducted in at Akola taluka, District Ahmadnagar, Maharashtra.

Climate and weather :

Geographically Akola is Situated at 19° 25' -19°28'N, Latitude and 73° 49' -73° 54'E Longitude with an elevation of 1319 m above mean sea level. The average maximum temperature is 32° C and minimum 16° C. The average rainfall about 766.7 mm.

Soil analysis :

Ten paddy SRI demo were selected for soil analysis and to recommendation of organic fertilizers. Soil analysis done by method given by Carter and Gregorich (2008).

System of rice intensification (S.R.I) method :

The comparative study of traditional method of rice cultivation and SRI method cultivation was carried out to know the effect of the SRI on the production of rice. Eight different local varieties were compared for their yield production,

The seedlings grown in the nursery beds were transplanted after just 8-10 days, or at the 2-leaf stage. Single seedling is transplanted. In the conventional or traditional method, a bunch of 3-6 seedlings are planted together in a clump. This leads to competition between the roots, and later the leaves. Single seedling does not compete and it can get more access to nutrients and water.

Seedlings are planted at wide spacing. There can be between 25 to 25 cm between single seedling. After

transplanting, much less water should be allowed onto the paddy. In the conventional method, paddies are kept flooded only to control weeds in the rice. But this means that less air is allowed in the soil. In SRI, out once the seedlings are established, water is managed to good root growth, so the plant can find plenty of nutrients from a bigger area.

As there is no standing water in SRI method, weeds would be more, Use the weeder on the 10th and 20th day after transplantation. The uniqueness of SRI method lies in not using the chemical pesticides and herbicides. The pests can be easily managed by using some organic concoctions either as a preventive measure or as and when needed. Amrut Pani is one such concoction.

Preparation of amrut pani :

Cow urine - one lit.
Cow dung - One kg
Jaggery (organic) - 250 g
Water (chlorine free) - 10 lit.

Preparation of jivamrut :

Cow urine -10 kg.
Cow dung-10 kg.
Jaggery (organic) -1kg.
Bengal gram powder -2 kg.
Water (chlorine free) - 200 lit.

Gravity drip irrigation system :

The assembly of the gravity drip irrigation system was done by using available material. It is low cost method which can easily be implemented, operated, with simple designing in hilly terrain areas. Akola region is situated about 1319m from mean sea level. The area of Akola region is mainly formed by hilly terrain and sloppy land. The farmers are poor also and there is problem of electricity.

To overcome this problem, the gravity drip irrigation system is one of the good solutions for small land holders of Akola.

The Sweet charley variety of strawberry was used for the evaluation of the gravity drip irrigation system. Fertilizer programme was applied approximately 450 kg of nitrogen, 100 kg of phosphorus, 580 kg of potassium, 288 kg of calcium and 76 kg of magnesium per hectare per season.

RESEARCH ANALYSIS AND REASONING

The findings of the present study as well as relevant discussion have been presented under following heads :

SRI demo soil analysis for N, P, K, value :

Ten paddy plots were analyzed for completion of nutrient requirement of soil. Above Table 1 observe the maximum demo

plot soil type is select sandy clay or sandy loam. That type of soil is mostly use for paddy cultivation in Akola region.

Table 1 shows the texture and nutrient value of the soil samples of selected ten demo plots. All soil samples were analyzed for the soil texture, nitrogen, phosphorus and potassium present in soil. All the soil samples are within the preferred limits of the nitrogen, phosphorus and potassium for the cultivation of the paddy field.

N, P, K value present in a soil sample quantity is re-present in kilogram per hectore. Plot number 1 have maximum nitrogen content about 250.88 kg/ha and minimum nitrogen is present in plot number 6 about 190.67 kg/ha. Maximum phosphorus present in plot number 8 is 25.14 kg/ha and minimum present in 6 is 10.77Kg/ha. The maximum potassium present in plot number 2, 6, 9 are about 560 kg/ha each, while it minimum in 3plot number 1 and 3, about 36 kg/

Table 1: Texture and nutrient value of soil sample

Demo plot no.	Soil Texture (as per mechanical analysis)				N kg/ha	P kg/ha	K kg/ha
	Clay	Silt	Sand	Texture category			
1.	9.1	39	52.3	Sandy clay	250.88	20.01	336
2.	8.95	64	27.5	Sandy clay	251.19	18.47	560
3.	37.7	39	22.9	Sandy clay	221.72	11.29	336
4.	37.7	39	22.9	Sandy loam	221.4	15.9	369.6
5.	16.3	74	9.39	Sandy clay loam	220.46	12.82	448
6.	4.9	22	73	Sandy loam	190.67	10.77	560
7.	24.7	52	24	Sandy loam	244.61	20.52	436.8
8.	19	46	35	Sandy loam	221.72	25.14	448
9.	23.5	37	93.6	Clay loam	219.52	15.39	560
10.	16.3	74	9.39	Sandy clay loam	220.46	12.82	448

Table 2: Showing pH, lime, organic carbon and organic fertilizer recommendation of soil sample

SIR demo No.	Lime %	Soil pH	Organic carbon %	Soil type	Recommendation
					Cow dung fertilizer
1.	5.63	7.07	0.18	Average fertility	15 bullock cart
2.	3.75	8.0	0.24	Medium fertility	10 bullock cart
3.	3.13	7.21	0.21	Good fertility	10 bullock cart
4.	2.5	7.94	0.21	Medium fertility	15 bullock cart
5.	4.38	6.99	0.18	Medium fertility	5 bullock cart
6.	3.75	7.27	0.27	Average fertility	10 bullock cart
7.	3.13	8.0	0.49	Average fertility	10 bullock cart
8.	4.38	7.03	0.12	Good fertility	5 bullock cart
9.	5	7.0	0.24	Average fertility	10 bullock cart
10.	4.38	6.99	0.18	Medium fertility	5 bullock cart

Table 3: Evaluation of SRI organic paddy crop

Sr. No.	Variety	Crop duration (day's)	SRI spacing (CM)	Cultivated area in m ²	SRI total yield (QT)	Traditional total yield (QT)	Yield diff. (QT)
1.	Rupali	90	25 × 25	1300	8.7	4.5	4.2
2.	Punam	90	25 × 25	500	2	1	1
3.	Indrayani	90	25 × 25	1000	5.25	4	1.25
4.	Pusa Basmati	120	25 × 25	400	2	1	1
5.	Dapptari	90	25 × 25	500	2.3	1.6	0.7
6.	RASGE	120	25 × 25	300	2.1	1	1.1
7.	Pusa Basmati	120	25 × 25	500	3.4	2.4	1
8.	Lakshmi	90	25 × 25	2000	9.8	6.6	3.2
9.	Lakshmi	90	25 × 25	500	3	2	1
10.	Vaishnavi	90	25 × 25	500	2.5	1.2	1.3

ha each.

SRI demo for organic fertilizer recommendation :

The recommended percentage of organic fertilizer can be described on the basis of the quality of the soil.

Table 2 shows the pH, lime, organic carbon present in the soil of 10 demo plots. The organic fertilizer application also recommended by considering the results of soil analysis. Plot number 1 soil have maximum lime content 5.53 per cent and plot number 4 have minimum lime content 2.5 per cent and organic carbon content is maximum 0.49 per cent in plot number 7 and minimum in plot number 8 about 0.12 per cent .

Yield of the SRI paddy crop compared with tradition paddy of same variety :

Eight local varieties of rice were compared with the traditional and SIR method to evaluate yield.

Table 3 shows evaluation of the production average yields of all varieties increased by 0.7 to 4.2 QT during the study period. The cultivated area for the cultivation of the different rice varieties ranging from the 300 to 2000 m². The spacing kept for the each plot was 25 × 25 cm. The comparative results of the SRI and Traditional yield in QT was calculated and yield difference of two methods also calculated. Crop duration of rice varieties varies from the 90 to 120 days.

Average tillers growth :

Table 4 shows the evaluation of traditional and S.I.R method paddy cultivation number of tiller increased approximately 50 to 55 per cent in S.I.R method. Tiller growth seems healthy and good. Variety Indrayani, Dapptari, Lakshmi and Vaishnavi shows the about double number of tillers growth by SRI method than traditional method.

Sr. No.	Variety	duration (day's)	Traditional method tillers.	S.I.R method tillers.
1.	Rupali	90	22	40
2.	Punam	90	23	43
3.	Indrayani	90	18	47
4.	Pusa Basmati	120	24	55
5.	Dapptari	90	17	42
6.	Rasge	120	24	55
7.	Pusa Basmati	120	24	55
8.	Lakshmi	90	22	40
9.	Lakshmi	90	18	40
10.	Vaishnavi	90	18	46

Performance of drip irrigation :

Table 5 shows average daily irrigation applied ml per plant for six months period. The daily irrigation rate was measured under the water requirement of strawberry plant in

different months. The water requirement increases as the growth of the plant increases it was because of the end of the monsoon season.

Table 5: Daily irrigation application in millimeter per plant

Sr. No.	Month	Average daily irrigation applied (ml/plant)
1.	July	150
2.	August	175
3.	September	190
4.	October	190
5.	November	190
6.	December	200

Strawberry yield in one season :

Table 6 shows result of average strawberry yield per month from per plant. The yield of strawberry was calculated in each month. In first two months is flowering stage. The remaining four months is fruiting stage for strawberry crop. During study, it was observed that in October to December months there was good yield of strawberry crop.

Table 6 : Results of average strawberry yield per month from per plant

Sr. No.	Month	Average daily irrigation applied (ml/plant)
1.	July	Plantation
2.	August	Flowering
3.	September	200
4.	October	300
5.	November	425
6.	December	100

Conclusion :

Effect of spacings :

The plant spacing 25 × 25 cm showed good result in increasing the number of tillers. The number of tillers were 50-55 per cent increased of each variety. The maximum tillers were produced by the variety of Pusa Basmati and Rasage. It might be due to the less plant competition and maximum availability of space, water, plant nutrient and light per plant during the growth stages of crop.

Effect on yield :

Based on the experimental results, the yield of rice was nearly increased 40 per cent and there was increased in yield by using SRI technique than traditional practicing. It can be indicated that rice varieties should be grown with 25 × 25 cm spacing (two sprouted seeds per hill) for maximum yield and better quality as well as more monetary returns.

Gravity drip irrigation system :

Used gravity base drip irrigation system, a low cost

irrigation method is suitable in Akola region for the cultivation of strawberry for small land holder. The average crop yield of strawberry per plant in one season was got 1025 g.

Furthermore, SRI need to be popularized among the farmers. There is need to develop package of practices for SRI methods for rice cultivation so that there will be more rice production per hectare of land. As the gravity drip irrigation system is low cost technique, it should be popularized among the farmers who have small land for the cultivation in rainfed

area so that farmers may be benefited which can empower the local people of that region. Nevertheless the study was done to find out new techniques of income with sustainable approach.

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