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Evaluation of irrigation and shading methods on nursery production of onion (*Allium cepa* L.)

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Abstract Kharif onion (*Allium cepa* L.), which is 20 % of total onion production, plays crucial role in filling supply gap from October -February. The productivity of *kharif* onion is very low as compared to other seasons. The kharif onion crop must be ready for harvest in the month of October-November to get higher profit. A study was undertaken at NRC for Onion and Garlic, Rajgurunagar during 2002-2005 with two methods of irrigation and six methods of shading for the production of nursery in summer months. It was found that growing of nursery on drip irrigation under 50% agrishade net or hessian cloth ensures 80-83% of seed germination with 58% final seedling stand as against 49 % and 27% respectively in surface irrigation with no shade.

Keywords: Irrigation, Shading, Nursary, Onion

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Introduction

Onion is an important commercial vegetable crop. It is grown predominantly in Rabi season but in same parts of India it is grown in Kharif and late Kharif season also (Singh, 2000).The Kharif season onion is harvested in the months of October -November. It fills the critical gap of demand of supply of onion and plays an important role in ensuring regular supply and price stabilization. But the productivity of kharif onion is low. There are several reasons for low productivity of kharif onion. The difficulty is production of healthy and sufficient seedling in summer is one of them. The germination of seed and seedling establishment is low due to crust formation, lack of proper soil moisture and scorching sunshine. Viewing these problems, an experiment was planned at to evaluate irrigation and shading method on nursary production of onion.

Materials and Methods

The experiment was conducted during summer season of 2003, 2004 and 2005 at Research Farm of NRC Onion and Garlic, Rajgurunagar. There were two main treatments i.e. drip irrigation and surface irrigation; and six shading treatments i.e. agrishade net (50% shading), agrishade net (75% shading), hessian cloth, nylon net, wheat straw mulch and control (no shade). These treatments were arranged in randomized block design with three replications. The seed of onion CV. Baswant – 780 was sown on 15th April every year at a spacing of 10 cm between lines. The beds were provided shading with different shading materials at a height of 5 feet from top and western side. For drip irrigation 16 mm hydrogol with inline emitter at 50cm and 4 lph water discharge were used. The data on days to germination of seeds, seedling height, root length etc were recorded. The three year pooled data were analysed by the method described by Panse and Sukhatme (1989).

Table 1: Effect of shading on nursery production in onion during summer

Treatments	Days to Germinate			% Field germination			% Final stand			Seedling Height (cm)		
	Surface Irrigation	Drip Irrigation	**Average**	Surface Irrigation	Drip Irrigation	**Average**	Surface Irrigation	Drip Irrigation	**Average**	Surface Irrigation	Drip Irrigation	**Average**
No Shading	11.53	11.33	**11.43**	49.20	63.31	**56.26**	20.44	33.51	**27.20**	19.14	18.1	**18.62**
Shading with 50% Agro-shade net	9.44	8.44	**8.94**	71.33	83.1	**77.22**	50.74	63.38	**57.07**	21.6	21.17	**21.39**
Shading with 75% Agro-shade net	9.22	8.56	**8.89**	73.66	78.25	**75.95**	52.07	61.0	**56.54**	20.74	22.5	**21.65**
Shading with Hessian cloth	8.89	9.22	**9.06**	65.12	79.67	**72.39**	53.14	63.37	**58.26**	19.60	19.52	**19.56**
Shading with White nylon net	9.11	9.28	**9.20**	62.35	68.22	**65.29**	40.96	44 52	**47.74**	19.76	19.47	**19.6**
Mulching with wheat straw	9.11	8.94	**9.03**	63.15	65.25	**64.2**	32.71	34.26	**33.49**	19.23	17.9	**18.57**
Average	9.54	9.30	**9.30**	63.15	72.9	**68.55**	41.68	50.01	**45.85**	20.01	19.79	**19.90**
CD (0.05) Irrigation		0.21			3.73			3.87			NS	
Shade		0.54			6.31			6.71			1.45	
Interaction		NS			9.23			9.45			2.04	

Table 2: Effect of shading on nursery production during summer

Treatments	Seedling Girth (mm)			No. of Leaves/plant			No. of roots/seedling			Root Length (cm)		
	Surface Irrigation	Drip Irrigation	**Average**	Surface Irrigation	Drip Irrigation	**Average**	Surface Irrigation	Drip Irrigation	**Average**	Surface Irrigation	Drip Irrigation	**Average**
No Shading	2.54	2.58	**2.56**	3.27	3.45	**3.36**	10.67	10.79	**10.73**	1.67	2.24	**1.96**
Shading with 50% Agro-shade net	2.32	2.36	**2.34**	3.56	3.48	**3.52**	11.04	10.58	**10.81**	1.68	2.05	**1.87**
Shading with 75% Agro-shade net	2.11	2.17	**2.14**	3.30	3.61	**3.46**	10.44	11.52	**10.98**	1.45	2.05	**1.75**
Shading with Hessian cloth	2.37	2.44	**2.40**	3.30	3.51	**3.41**	10.82	11.74	**11.28**	1.68	2.31	**1.99**
Shading with White nylon net	2.33	2.39	**2.36**	3.29	3.44	**3.37**	11.15	10.42	**10.79**	1.75	2.01	**1.88**
Mulching with wheat straw	2.51	2.54	**2.52**	3.44	3.34	**3.39**	10.45	10.48	**10.47**	1.82	2.01	**1.92**
Average	2.36	2.41	**2.39**	3.36	3.47	**3.42**	10.76	10.92	**10.84**	1.68	2.11	**1.90**
CD (0.05) irrigation		NS			NS			NS			0.25	
Shade		0.24			NS			NS			NS	
Interaction		0.36			NS			1.16			0.62	

Results and Discussion

Effects of irrigation method

The days required for germination of seeds were significantly lesser in drip irrigation (9.30 days) than the surface irrigation (9.54 days). Similarly percentage field germination was higher in drip irrigation (72.9 %) than the surface irrigation (63.15%). The final stand of seedling was better in drip irrigation(50 %) than surface irrigation (41.68%). The seedling height was more in surface irrigation (20.01 cm) but seedling girth was more in drip irrigation (2.41 mm). Similarly the average length of roots was significantly higher in drip irrigation (2.03 cm) than surface irrigation (1.82 cm; Table 1 & 2). As far as water saving is concerned, there was more than 40% water saving in drip irrigation than surface irrigation (Fig. 1). The higher germination and seedling stand in drip irrigation may due to better soil moisture, aeration and no crust formation in comparison to surface irrigation. It is a well known fact that drip irrigation ensures better moisture, aeration in the root zone and the fluctuation in soil moisture is less (Sankar *et al*,2001; Tiwari *et al*.2003). Finch-Savage (1986) found that major cause of pre-emergence seedling losses are due to soil moisture stress. The better germination in drip irrigation may be the result of constant optimal soil moisture conditions. This may be the reason for better root growth and seedling girth too.

Effect of shading material

Among the various materials, days to germination was lowest in agrishade net (50%), which was 8.54 days. All the shading treatments and mulching was found superior than control for field germination. The final stand of nursery after 45 days was highest in hessian cloth shading (58.26 %). This is closely followed by 50% agrishade net (57.67%). The final stand in control was only 27.2 percent (Table 1). As far as the seedling height is concerned, it was highest in 75% agrishade net and 50% agrishade net (21.39 cm.). These

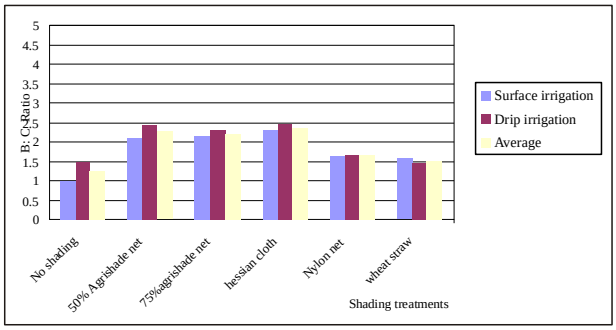

Fig.1. Benefit -Cost ratio in irrigation methods and shading treatments

treatments were better than other treatments including control. The seedling girth was more in control (2.58 mm) and wheat mulch straw (2.52 mm). These treatments were on par with all other treatments except 75% agrishade net where the seedling girth was 2.14mm. The number of leaves and number of roots per seedling were also at par in all-shading treatments (Table 1 & 2). The higher germination and better seedling in shading were also recorded by Hussain *et al* (1991). They found that partial shade of trees during July produced best nursery in 45-50 days after seeding in onion. The higher seedling height and lower seedling girth in agrishade net may be due to lower sun light availability to young plants due to blockage of sun light by these shading materials.

Effects of irrigation and shading

Among various combinations of irrigation treatments, least number of days (8.44) germination were required in 50% agrishade net with drip irrigation. The highest stand of seedling (63.38%) was also recorded in this treatment combination. This was closely followed by hessian cloth shading with drip irrigation (63.37%). As far as the seedling height is concerned, it was highest in 75% agrishade net with drip irrigation. This was significantly higher than control. Highest seedling girth (2.58 mm) of seedling was recorded in control with drip irrigation but this was at par with most of the treatment combinations except 75% agrishade net (2.11mm). The average number of leaves and root per seedling were statistically at par in all the treatment combination but the root length was highest (2.31 cm) in hessian cloth and drip irrigation combination (Table 1 & 2).

Economics

The Benefit cost ratio in drip irrigation (1.96) was higher than surface irrigation (1.79). Among the shading material highest B:C ratio was recorded in hessian cloth 2.37). Among the combinations of irrigation and shading, the highest B:C (2.45) ratio was found in hessian cloth with drip irrigation. This was followed by 50% agro shade net with drip irrigation (2.41). These two combinations were found profitable than others (Fig. 1).

सारांश

खरीफ प्याज जो कुल प्याज उत्पादन का 20 प्रतिशत है, अक्तूबर से फरवरी माह तक प्याज की आपूर्ति अन्तर को भरने में क्रान्तिक भूमिका निभाता है। खरीफ प्याज की उत्पादकता अन्य मौसमों की तुलना में बहुत कम है। अधिक लाभ के लिए खरीफ मौसम के प्याज को अक्तूबर से दिसम्बर माह तक खुदाई के लिए तैयार होना चाहिए। इन समयसारणी का पालन के लिए बुवाई गर्मी के महीने में होनी

चाहिए। लेकिन गर्मी के मौसम में अधिक तापमान तथा पानी की कमी के कारण पौधशाला स्थापित करना कठिन है। इसलिए राष्ट्रीय प्याज एवं लहसुन अनुसंधान केन्द्र पर 2002–2005 के दौरान दो सिंचाई विधियों तथा छः छाया करने की विधियों पर प्रयोग किये गये। यह ज्ञात हुआ कि टपक सिंचाई के साथ 50 प्रतिशत एग्रीसेडनेट या टाट के कपड़े से छाया करने से 83 प्रतिशत बीज अकुंरण तथा 58 प्रतिशत रोपण योग्य पौध प्राप्त हुई जबकि धरातलीय सिंचाई और बिना छाया मे यह क्रमशः 49 प्रतिशत और 20 प्रतिशत था।

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