



Effect of nitrogen and weed management on weed control efficiency and yield of fodder turnip

Govind Kumar*, Magan Singh, Rakesh Kumar, Koushik Paul, Pooja Gupta Soni and Avinash Chauhan

ICAR-National Dairy Research Institute,
Karnal-132 001, India.

Received: 09-06-2015

Accepted: 24-10-2015

DOI: 10.18805/asd.v35i4.6871

ABSTRACT

A field experiment was conducted at Forage Research and Management Centre, NDRI, Karnal during *rabi* season in 2013-14 to study the effect of nitrogen application and weed management on growth and yield of fodder turnip (*Brassica campestris* var. *rapa*) with four levels of nitrogen (0, 50, 100, and 150 kg N/ha) and four weed management practices (pendimethalin @ 1.0 kg a.i./ha, hand weeding, isoproturon @ 0.75 kg a.i./ha and weedy check) in split plot design. Among the nitrogen treatments 150 kg nitrogen/ha gave the highest growth, yield and better quality of fodder turnip. Application of pendimethalin @1.0 kg a.i. proved better in terms of growth and yield of turnip. Weed control efficiency was 65% with 150 kg N/ha and 83.23% with pendimethalin 1.0 kg a.i./ha.

Key words: Green fodder, Hand weeding, Isoproturon, Nitrogen, Pendimethalin, Turnip.

India has largest animal population of the world and first position in milk production. But productivity is less as compared to developed countries due to shortage of green, succulent and nutritious fodder which is mainly responsible for poor milk yield of milch animals. There is a big gap between the requirement and supply of green fodder during different month of the year. In north India there is scarcity of fodder during November - December and May -June. Therefore, there is need to increase fodder production and ensure fodder production during lean periods. There is no scope to increase area under fodder crops. Under such situation, adoption of improved package of practices (Kumar, 2012, Kumar, 2013, Kumar, 2014a and Kumar, 2014b) intensive crop rotation, inclusion of short duration crops in existing rotations of grain, fodder and cash crops and better agronomic practices have great significance.

Turnip (*Brassica campestris* var. *rapa*) is a winter, short duration crop, which fit well in intensive crop rotations. Its fodder is rich in readily available carbohydrate and crude protein as well as it is highly palatable, succulent and easily digestible. The use of herbicides has great scope in fodder crops as they provide effective control of weeds and when applied at normal doses do not have any adverse effect on palatability of fodder and animal health. Nitrogen management is the most important factor for optimum growth and development of turnip. It is most important factor affecting the root dry matter, root crude protein, leaf dry

matter yield, and leaf crude protein of fodder turnip (Soheir *et al.*, 2012). So present study was conducted to know the effect of nitrogen application and weed management on yield and weed control efficiency of fodder turnip (*Brassica campestris* var. *rapa*) during winter lean periods.

The field experiment was conducted during *rabi* season in 2013-14 at Forage Research and Management Centre, NDRI, Karnal located at 29°45' North latitude, 76°58' East longitudes and at an altitude of 245 m above mean sea level. Climate of this zone is sub tropical. This zone receives rainfall from both southwest and northeast monsoons and faces extremes of both high and low temperature. During summer maximum temperature goes up to 45 °C and in winter minimum temperature reaches near freezing point. The soil of the experimental field was clay loam in texture, neutral in reaction, medium in organic matter and phosphorus (25.5 Kg/ha), high in potassium (256kg/ha) and low in nitrogen (191kg/ha).

The experiment was executed in split plot design with four levels of nitrogen (0, 50, 100, and 150 kg N/ha) in main plots and four weed management practices (pendimethalin @1.0 kg a.i./ha, hand weeding, isoproturon @ 0.75 kg a.i./ha and weedy check) in sub plots with four replications. The turnip variety— Purple top was used as test crop and sown at row to row spacing of 30 cm. Half dose of nitrogen according to treatment and full dose of P₂O₅ 60kg/ha, K₂O 30kg/ha were applied at the time of sowing

*Corresponding author's e-mail: kumargovind050@gmail.com.

and remaining half nitrogen was applied at 25 days after sowing (DAS) as top dressing. Pendimethalin @1.0 kg a.i./ha was applied as pre emergence at 2 DAS. Isoproturon @ 0.75 kg a.i./ha at 25 DAS as post emergence spray by knap sack sprayer with flood jet deflector nozzle after proper calibration. In weedy check no weed control method was applied. Crop was harvested manually by gently pulling the plants and weighing root and shoot yield separately. The number of weeds present in randomly fixed one m² area in each plot and counted at 30, 60 DAS. Weeds were further classified into monocots, dicots and sedges. Dry weight of weeds was recorded at 30 and 60 DAS. The weeds were uprooted from the destructive sampling area of one m² each time and were oven dried to a constant weight at 60-70 °C and the dry weight of weeds was expressed in g per m². Weed control efficiency was calculated on dry weight basis by adopting the formula.

$$\text{WCE (\%)} =$$

$$\frac{\text{Weed dry weight in weedy check (g)} - \text{Weed dry weight in treatment (g)} \times 100}{\text{Weed dry weight in weedy check (g)}}$$

The data collected were subjected to statistical analysis appropriate to the design and significance of different sources of variations was tested by Fisher's and Snedecor's F-test at probability level of 0.05 (Chandel, 1984).

Major weed species observed in experimental field were Dicot weeds - *Trianthema portulacastrum*, *Coronopus didymus* L., *Parthenium hysterophorus*, *Anagallis arvensis* L., *Chenopodium album*, *Commelina benghalensis* L., Monocot weeds- *Phalaris minor*, *Cynodon dactylon*, *Melilotus alba*, sedge weeds -*Cyperus rotundus* L. etc.

Application of 150 kg N/ha recorded significantly higher weed population, further, among monocot, dicot and sedge weeds, dicot weeds least population was observed with pendimethalin and maximum weed population was observed with control at 30 DAS. At 60 DAS weed population increase up to 50kg N/ha than decreased significantly (Table 1). These results were similar with Zaharenka (2000), Sandhu *et al.*, (2002) and Channappagoudar *et al.* (2007).

Higher weed dry matter was recorded with 150 kg N/ha followed by 100, 50 and control. Among weed management treatments least weed dry matter was observed with pendimethalin and maximum with control at 30 DAS. These findings are similar with Fayed *et al.*, (1983). At 60 DAS weed dry matter increase up to 50kg N/ha than decreased significantly. Minimum weed population was observed with pendimethalin compared to control. These results are in close conformity with Moonen and Barberi, (2004) and Teasdale *et al.*, (2007).

Weed control efficiency decrease up to 50 kg N/ha than increase with increase the dose of nitrogen. Higher weed control efficiency was observed with pendimethalin and least with weedy check.

Green fodder yield of root and shoot was increased significantly with increase the level of nitrogen (Table-2). Highest yield was observed with 150 kg N/ha followed by 100 kg N/ha, 50 kg N/ha and control. The results were in conformity with the findings of Jan Krezel and Kolota, (2008). Pendimethalin @ 1.0 kg a.i./ha observed highest green fodder yield followed by hand weeding, isoproturon @ 0.75 kg a.i./ha and weedy check. Pendimethalin control

TABLE 1: Effect of nitrogen application and weed management on yield weed control efficiency

Treatment	Weed population 30 DAS (m ²)			Weed population 60 DAS (m ²)			Weed DM (g/m ²)		Weed control efficiency (%)
	Monocot	dicot	sedge	Monocot	dicot	sedge	30DAS	60DAS	
N level (kg/ha)									
0	2.08	3.29	2.50	3.61	56.81	9.31	2.50	3.61	56.81
50	2.41	3.36	3.16	4.81	50.77	10.41	3.16	4.81	50.77
100	2.76	2.01	3.57	2.96	63.29	6.22	3.57	2.96	63.29
150	3.02	1.53	3.85	2.41	65.41	5.09	3.85	2.41	65.41
SEm ±	0.03	0.02	0.02	0.02	0.20	0.10	0.02	0.02	0.20
CD (P =0.05)	0.06	0.04	0.05	0.05	0.45	0.22	0.05	0.05	0.45
Weed management									
Pendimethalin 1.0 kg a.i./ha	1.89	1.74	2.50	1.44	83.23	4.88	2.50	1.44	83.23
Hand weeding	2.39	2.23	2.73	1.91	77.55	5.67	2.73	1.91	77.55
Isoproturon @ 0.75 kg a.i./ha	2.55	2.83	2.85	2.12	75.50	6.74	2.85	2.12	75.50
Weedy check	3.43	3.80	5.01	8.35	0.00	13.74	5.01	8.35	0.00
SEm ±	0.04	0.03	0.02	0.06	0.38	0.09	0.02	0.06	0.38
CD (P =0.05)	0.09	0.06	0.04	0.11	0.77	0.18	0.04	0.11	0.77

TABLE 2: Effect of nitrogen application and weed management on yield.

Treatment	ShootYield (t/ha)	Shoot DM yield (t/ha)	RootYield (t/ha)	Root DM Yield (t/ha)	Total Yield (t/ha)	Total DM yield (t/ha)
Nitrogen level (kg/ha)						
0	17.93	2.60	32.01	3.51	49.94	6.11
50	21.43	3.00	38.10	4.02	59.44	7.01
100	25.94	3.44	46.33	4.52	72.27	7.96
150	29.23	3.59	52.20	4.58	81.42	8.17
SEm ±	0.19	0.05	0.33	0.04	0.52	0.12
CD(P= 0.05)	0.42	0.10	0.75	0.08	1.18	0.25
Weed management						
Pendimethalin @1.0 kg a.i/ha	27.43	3.55	48.98	4.63	76.42	8.18
Hand weeding	26.35	3.50	47.06	4.61	73.42	8.11
Isoproturon @ 0.75 kg a.i./ha	24.33	3.27	43.45	4.31	67.78	7.58
Weedy check	16.32	2.30	29.14	3.09	45.45	5.39
SEm ±	0.26	0.03	0.47	0.07	0.74	0.06
CD (P = 0.05)	0.54	0.06	0.96	0.15	1.50	0.14

weed population more effectively than hand weeding, isoproturon and weedy check. So, crop weed competition was reduced and yield was increased Saimbhi and Randhawa, (1976b).

150kg N/ha was significantly superior to root and shoot dry matter yield than control. Pendimethalin @ 1.0 kg a.i./ha significantly showed higher dry matter yield compared to hand weeding, isoproturon and weedy check.

Total green and dry fodder yield was significantly increased with 150 kg N/ha followed 100,50 kg N/ha and control and among weed management treatments with pendimethalin compared to rest of treatments.

REFERENCE

- Chandel, S. R. S. 1984. Analysis of variance. A hand book of Agricultural Statistics, 7thEd. Pp: 358-359.
- Channappagoudar, B.B., Koti R.V., Biradar, N.R. and Bharmagoudar, T.D. (2007). Influence of herbicides on growth parameters and yield in radish. *Karnataka Journal of Agricultural Science* **20**: 710-714.
- Fayed, M.T., M.T. Mostafa and Hassanein, E.E. (1983). Increasing the efficiency of herbicides in controlling cotton weeds by one light hoeing. *Proc. 1st Conference of agronomy, Egypt Society of Crop Science* **2**: 679-688.
- Jan Krezel, Eugeniusz Kolata. 2008. The effects of nitrogen fertilization on yielding and biological value of Chinese cabbage grown from seedlings for autumn harvest. *Journal Elemental* **13**:255-260.
- Kumar, R. (2014a). Crop technology demonstration: an effective communication approach for dissemination of wheat production technology. *Agricultural Science Digest* **34**:131-134.
- Kumar, R. (2014b). Assessment of technology gap and productivity gain through Crop technology demonstration in chickpea. *Indian J. Agric. Res.*, **48**: 162-164.
- Kumar, R. (2013). Evaluation of Crop technology demonstration of mustard crop in Transitional plain of Inland Drainage Zone of Rajasthan. *International Journal of Agricultural and Statistical Sciences* **9**:657-660.
- Kumar, R. (2012). Crop technology demonstration: An effective communication approach for dissemination of sustainable Green Gram production technology. *Crop Improvement* **39**:1583-1584.
- Moonen, A.C. and Barberi, P. (2000). Size and composition of the weed seedbank after 7 years of different cover-crop-maize management systems. *Weed Research* (Oxford). **44**: 163-177.
- Saimbhi, M. S. and Randhawa, K. S. (1976b). Studies on weed control in the spring crop of tomato (*Lycopersicon esculentum* Mill.). *Journal of Research*, Punjab Agricultural University, India **13**: 70-73.

CONCLUSIONS

It was concluded that 150 kg N/ha showed that higher, (green and dry fodder) of the root and shoot yield and weed control efficiency followed by 100kg N/ha, 50kg N/ha and control. Pendimethalin observed maximum yield (green and dry fodder), the root and shoot yield compared to hand weeding, isoproturon and weedy check.

ACKNOWLEDGEMENTS

I convey special acknowledgement to Dr. A. K. Shrivastava, Director, NDRI, Karnal for providing necessary facilities for carrying out this study and financial assistance in the form of NDRI Institutional fellowship during my Master's programme.

- Sandhu, K.S., Singh, D., Sandhu M.S., Gill B.S. and Singh J. (2002). Weed management in seed crop of radish. *Journal of Research of Punjab Agriculture University* **39**:504-07.
- Sebahattin Albayrak and Necdet Camas. (2006). Performances of forage turnip (*Brassica rapa L.*) cultivars under different nitrogen treatments. *Journal of Faculty of Agriculture Ondokuz Mayıs University* **21**: 44-48.
- Soheir, E. El-Sherbeny., S.F., Hendawy, A.A., Youssef, N.Y., Naguib and Hussein, M.S. (2012). Response of Turnip (*Brassica rapa*) Plants to minerals or organic fertilizers treatments *Journal of Applied Sciences Research* **8**: 628-634.
- Teasdale, J.R., Brandsaeter, L.O., Calegari, A. and Skora Neto, F. (2007). Cover crops and weed management. pp. 49-64. *In*: Non-chemical weed management: principles, concepts and technology. Eds Upadhyaya M.K. and Blackshaw R.E. Wallingford, Cambridge, United Kingdom
- Zaharenka, A. V. (2000). Theoretical Principles for Determining Weed Composition in Pagro-ecosystems, Moscow, pp. 468.