EFFECT OF NITROGEN AND PHOSPHORUS ON YIELD ATTRIBUTING AND YIELD OF DILL (*ANETHUM SOWA* ROXB)

M.K. Meena*, P.R. Kameriya and P.R. Raiger*****

Department of soil science and Agricultural chemistry, college of Agriculture,
S.K. Rajasthan Agricultural University, Bikaner-334006
Email : mk2010soil@gmail.com

Abstact: A 2-year experiment was conducted to find out the effect of nitrogen and phosphorus on growth and seed yield of dill (*Anethum sowa* Roxb). The crop planted during rabi 2006-07 and 2007-08. The nitrogen application upto 90 kg ha^{-1} significantly increased the number of umbels per plant, seeds per umbel, seed yield, straw yield and biological yield, net returns and B:C ratio. Whereas, branches per plant increased significantly upto 60 kg N ha^{-1} . Significantly higher seed yield (1239 kg ha^{-1}) , net returns (Rs.27890 ha^{1}) and B:C ratio (3.24)was recorded with 90 kg N while, significant increase in yield attributes like number of umbels per plant, seeds per umbel , seed yield, straw yield, biological yield, net returns and B:C ratio of dill was observed upto 40 kg P_2O_5 ha^{-1}. Whereas, branches per plant, test weight, harvest index, significantly increased upto 20 kg P_2O_5 ha^{-1} . Significantly higher seed yield (1163 kg ha^{-1}), net returns (Rs. 25507 ha^{-1})and B:C ratio (3.05) were recorded with 40 kg P_2O_5 $ha^{-1.}$ Interaction effect of 90kg N with 40kg P_2O_5 ha^{-1} were found significant higher for umbels per plant and seed yield.

Keywords: dill, nitrogen, phosphorus, economics

INTRODUCTION

Dill seed (*Anethun sowa* Roxb) is one of the important seed spices belongs to family umbelliferae.It used (whole and ground) as a condiment in soups, saladas, processed meats, sausages, spicy table sauces and in dill pickling. Dill stems and blossom heads are used for dill pickling and flavouring soup and perfume industries. The green herb is used as a flavouring agent. Dill oil or its emulsion in water commonly known as dill water and it is considered to be an aromatic, carminative, specially useful in control of flatulence, colic pain, hyperacidity, vomiting, diarrhoea and hiccups due to indigestion in infants and children. Its application with turmeric powder prevents formation of ulcers and heals them quickly. Leaves boiled in sesame oil makes an excellent liniment for reducing swelling and pains of the joints. Seeds are effective in respiratory disorders likes: colds, influenza and bronchitis. It is also useful in inflammatory and painful conditions of piles for which it is used with vacha as fumigation therapy. It is very useful for women delivery for expulsion of placenta and promotes milk secretion . India is the largest producer of dill in the world. It is mainly cultivated in states like: Rajasthan, Gujarat, Madhya Pradesh, Andhra Pradesh, Maharashtra, Uttar Pradesh, Punjab and Haryana. India produces 8648 tonnes of dill seed from 12788 hectares land with productivity 500 kg ha^{-1}. Rajasthan occupies the first position in production and acreage. The production of dill in Rajasthan is 1841 tonnes from 4519 hectares. Rajasthan contributes major production of dill seed in India. It is mainly cultivated in the districts like: Chittorgarh, Jhalawar, Udaipur, Kota, Bundi, Nagaur and Jodhpur. The low productivity of dill is due to lack of improved varieties, production and protection technology available to the farmers (Tiwari and Agrawal, 2004). Because of low productivity, there is a limited scope of increasing the area under this crop on account of competition with food grains and oil seed crops. In order to increase its production , more emphasis should be given for developing high yielding varietes and production technologies of dill crop, which has enormous medicinal and aromatic values. Thus present study therefore made to find out the effect of nitrogen and phosphorus levels on growth and yield parameters.

MATERIAL AND METHOD

The two years field experiment was conducted during rabi seasons of 2006-07 and 2007-08 at Agronomy farm, college of Agriculture, Swami Keshwanand Rajasthan Agricultural University, Bikaner in factorial randomized design in four replication. In all there was twenty treatments combinations, consisting of five levels of nitrogen (0,30,60,90,and 120kg N ha^{-1}) and 4 level of phosphorus (control ,20,40,and 60 P_2O_5 kg ha^{-1}). The soil of the experimental field was loamy sand in nature containing available 106.3kg N,16.15kg P_2O_5, 170.35kg K_2O ha^{-1} in 0-30 cm soil depth with pH 8.36 and 0.14 percent organic carbon content . the dill variety NRCSS-AD-2 was sown on 14.10.2006 and 20.10.2007 maintaining 30 cm row to row and 10 cm plant distance with a seed rate of 7 kg ha^{-1} . Growth and development parameters were observed from the plot . Seed yields, obtained from the plots were converted into kg ha^{-1}.

RESULT AND DISCUSSION

Effect on yield and yield attributes

The nitrogen application upto 90 kg ha^{-1} significantly increased the number of umbels per plant, seeds per

umbel, seed yield , straw yield and biological yield while application of nitrogen upto 60 kg ha^{-1} significantly increased the plant height and number of branches per plant. Significantly higher seed yield [1239 kg ha^{-1}) was recorded with 90 kg N ha^{-1} . On the basis of average of two years ,significantly highest seed yield stover yield ,biological yield was observed under 90kg ha^{-1} , which was at par to 120 kg N ha^{-1} and 65.64,24.52 and 7.55per cent, 31.81,15.91and 6.14 per cent and 39.52, 18.16 and6.52 per cent significantly higher over control,30 and 60kgNha^{-1}, respectively. Adequate supply of N in early growth period of a plant is considered important in promoting rapid vegetative growth and branching, thereby ,increasing the sink size in terms of flowering and seed setting. Thus, N fertilization stimulated seed setting and increased the number of umbels per plant, umbellets per umbel ,seeds per umbellet and test weight significantly.The seed yield, being a function primarily of the of the cumulative effect of these parameters , increased significantly by 491 kg ha^{-1} due to N fertilization at 90kg ha^{-1}. Thus, simple response to N at this level worked out to be 5.46 kg seed per kg of N applied.

Number of branches per plant , umbel per plant and seeds per umbel ,seed yield, straw yield and biological yield increased significantly with the increase in the level of applied phosphorus upto 40 kg ha^{-1} , while ,test weight increased significantly upto 20 P_2O_5 kg ha^{-1} .On the basis of average of two years highest seed yield (1163kg kg ha^{-1}) and biological yield (4575 kg ha^{-1})was observesed with the application of 40 kg P_2O_5 ha^{-1} and found 29.08 and 9.20 per cent, 21.07 and 7.01 per cent significantly higher over control and 40 kg P_2O_5 ha^{-1} respectively. The increase in straw yield due to application of phosphorus could be attributed to increased vegetative growth possibly the result of phospohorus could be attributed to increased vegetative growth, possibly the result of effective uptake and utilization of other nutrients absorbed through its extensive root system developed under phosphors fertilization. The increased seed yield was the result of greater transloaction of photosynhates from source to sink. Patel et al.(2000)tuncturk and tuncturk(2006)reported the same experimental findings .

Economic

Application of 90 kg N ha^{-1} to dill crop recorded an additional net return of Rs.27890 ha^{-1} with a higher B:C ratio of 3.24 while ,40 kg P_2O_5 ha^{-1} recorded significantly higher net returns (RS.25507 ha^{-1}) and higher B:C ratio(3.05) .This might be due to increase in seed in diminishing manner under the increasing levels of phosphorus. These results corroborate the findings of verma (1997).

Table. 1: Effect of nitrogen and phosphorus levels on net returns and B:C ratio of dill

Treatments	Net returns (Rs. ha^{-1})			B:C ratio		
	2006-07	2007-08	Pooled	2006-07	2007-08	Pooled
Nitrogen levels (N kg ha^{-1})						
N_0	13,213	12,784	12,999	2.14	2.10	2.12
N_{30}	21,851	19,414	20,633	2.85	2.64	2.75
N_{60}	26,112	24,688	25,400	3.15	3.04	3.09
N_{90}	28,801	26,978	27,890	3.31	3.17	3.24
N_{120}	28,798	27,059	27,929	3.25	3.12	3.19
S.Em±	493	499	351	0.04	0.04	0.03
CD (P=0.05)	1,397	1,414	983	0.11	0.12	0.08
Phosphorus levels (P_2O_5 kg ha^{-1})						
P_0	18,759	17,269	18,014	2.63	2.50	2.57
P_{20}	23,817	21,883	22,850	3.00	2.83	2.91
P_{40}	26,136	24,879	25,507	3.10	3.00	3.05
P_{60}	26,310	24,707	25,508	3.04	2.91	2.97
S.Em±	441	447	314	0.04	0.04	0.03
CD (P=0.05)	1,250	1,265	880	0.10	0.11	0.07

Table. 2: Effect of nitrogen and phosphorus levels on umbel per plant, seeds per umbel and test weight of dill

Treatments	Branches per plant			Umbel per plant		Seeds per umbel			Test weight (g)			
	2006-07	2007-08	Pooled	2006-07	2007-08	Pooled	2006-07	2007-08	Pooled	2006-07	2007-08	Pooled
Nitrogen levels (N kg ha^{-1})												
N_0	13.46	11.48	12.47	29.68	26.48	28.08	147.38	138.96	143.17	3.01	2.81	2.91
N_{30}	16.20	13.25	14.73	36.49	33.21	34.85	158.04	149.69	153.86	3.29	2.99	3.14
N_{60}	18.38	15.58	16.98	41.91	39.53	40.72	169.93	160.23	165.08	3.49	3.15	3.32
N_{90}	18.71	15.90	17.31	47.05	45.68	46.36	181.54	170.82	176.18	3.55	3.21	3.38
N_{120}	18.80	16.26	17.53	48.38	46.28	47.33	186.36	176.32	181.34	3.58	3.24	3.41
S.Em±	0.56	0.46	0.36	0.55	0.57	0.40	3.48	3.26	2.39	0.06	0.05	0.04
CD (P=0.05)	1.59	1.29	1.01	1.56	1.61	1.11	9.86	9.24	6.68	0.18	0.13	0.11
Phosphorus levels (P_2O_5 kg ha^{-1})												
P_0	15.48	12.44	13.96	31.08	29.44	30.26	155.70	145.84	150.77	3.20	2.93	3.06
P_{20}	17.06	14.70	15.88	40.32	37.28	38.80	165.56	155.41	160.49	3.38	3.09	3.24
P_{40}	17.79	15.27	16.53	45.15	42.71	43.93	174.76	165.56	170.16	3.46	3.14	3.30
P_{60}	18.11	15.56	16.84	46.26	43.51	44.88	178.58	169.99	174.29	3.49	3.15	3.32
S.Em±	0.50	0.41	0.32	0.49	0.51	0.35	3.11	2.92	2.13	0.06	0.04	0.03
CD (P=0.05)	1.42	1.15	0.91	1.39	1.44	0.99	8.82	8.26	5.98	0.16	0.12	0.10

Table . 3: Effect of nitrogen and phosphorus levels on yields and harvest index of dill

Treatments	Yields (kg ha^{-1})									Harvest index (%)		
	Seed yield			Stover yield			Biological yield					
	2006-07	2007-08	Pooled	2006-07	2007-08	Pooled	2006-07	2007-08	Pooled	2006-07	2007-08	Pooled
Nitrogen levels (N kg ha^{-1})												
N_0	754	742	748	2,626	2,435	2,531	3,381	3,177	3,279	22.04	23.10	22.57
N_{30}	1,033	957	995	2,932	2,824	2,878	3,964	3,781	3,872	26.06	25.32	25.69
N_{60}	1,174	1,130	1,152	3,191	3,095	3,143	4,366	4,225	4,295	26.45	26.57	26.51
N_{90}	1,267	1,211	1,239	3,401	3,270	3,336	4,668	4,481	4,575	27.29	26.99	27.14
N_{120}	1,277	1,223	1,250	3,442	3,326	3,384	4,719	4,550	4,634	27.04	26.90	26.97
S.Em±	15	16	11	71	54	45	72	59	46	0.92	0.57	0.54
CD (P=0.05)	44	44	31	200	154	125	203	167	130	2.60	1.61	1.51
Phosphorus levels (P_2O_5 kg ha^{-1})												
P_0	923	878	901	2,833	2,608	2,720	3,757	3,486	3,621	23.77	24.65	24.21
P_{20}	1,095	1,036	1,065	3,085	2,978	3,032	4,181	4,014	4,097	26.08	25.58	25.83
P_{40}	1,182	1,144	1,163	3,273	3,168	3,221	4,456	4,312	4,384	26.51	26.47	26.49
P_{60}	1,203	1,154	1,178	3,282	3,206	3,244	4,485	4,359	4,422	26.74	26.40	26.57
S.Em±	14	14	10	63	49	40	64	53	41	0.82	0.51	0.48
CD (P=0.05)	39	39	27	179	138	112	181	149	116	2.32	1.44	1.35

Photo 4.10 Effect of Nitrogen and Phosphorus on Dill crop

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