

EFFECT OF GRADED LEVELS OF NITROGEN ON THE YIELD AND QUALITY OF LEMONGRASS OIL*

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Among the various essential oil plants grown in India, lemongrass (*Cymbopogon flexuosus* (D. C.) Stapf.) is a major crop grown in Kerala. Very little work has been done in Kerala on the manurial requirements of lemongrass and its pattern of response to application of fertilisers. An experiment was conducted to investigate the effect of different levels of nitrogen on the yield of grass and oil and oil quality and the results obtained are presented in this paper.

Materials and Methods

The experiment was conducted at the Aromatic and Medicinal Plants Research Station, Odakkali from May 1979 to February 1980. This study was carried out as a part of the experiment laid out at the Aromatic and Medicinal Plants Research Station, Odakkali in 1977. The soil of the experimental area is clay loam with organic carbon 1.2% and total nitrogen 0.112% with a pH of 5.6. The design of the experiment was randomised block replicated four times. Factorial combinations of 3 varieties of lemongrass, RRL 16 (developed by selection at the Regional Research Laboratory, Jammu), SD 68 (mutant developed by the Central Institute of Medicinal and Aromatic Plants, Lucknow), OD 19 (developed by selection at the Lemongrass Research Station, Odakkali) and 3 levels of nitrogen viz., 0, 50 and 100 kg/ha were the treatments. Nitrogen was given as a single dose with premonsoon showers in May. The crop was harvested at an interval of 55 days. Distillation of grass was carried out in experimental copper stills using pressure steam from a boiler at 0.7 kg/sq. cm uniform pressure. The duration of distillation was one hour and thirty minutes. The oil vapour condensed and collected in the receiver was carefully removed and separated from water using a separating funnel. The citral content of the oil was estimated using the bisulphite method prescribed by the Indian Standards Institution.

Results and Discussion

The results are presented in Table 1 to 5. Varieties varied significantly in grass yield in all the harvests. OD 19 and SD 68 were on par and superior to RRL 16. Total grass yield also followed the same pattern. The lowest grass yield of RRL 16 was due to the lowest height of plants of the variety.

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Table 1
Yield of grass (t/ha) at different harvests

Treatments	Harvests					Total
	I	II	III	IV	V	
<i>Varieties</i>						
RRL 16	2.40	3.96	2.74	2.98	0.79	12.87
SD 68	4.55	7.81	6.87	7.53	1.39	28.15
OD 19	4.66	8.58	7.65	6.64	1.50	29.03
'F' test	Sig	Sig	Sig	Sig	Sig	Sig
<i>N (kg/ha)</i>						
0	3.37	5.18	4.54	5.54	1.16	19.79
50	4.10	6.74	5.82	5.41	1.22	23.29
100	4.15	8.42	6.89	6.20	1.29	26.95
'F' test	N S	Sig	Sig	N S	N S	Sig
SEm \pm	0.295	0.382	0.383	0.304	0.111	1.432
CD (0.05)	0.862	1.555	1.200	0.885	0.325	4.179

Table 2
Oil content of grass (per cent) at different harvests

Treatments	Harvests				
	I	II	III	IV	V
<i>Varieties</i>					
RRL 16	0.433	0.364	0.532	0.483	0.610
SD 68	0.219	0.361	0.298	0.235	0.469
OD 19	0.213	0.251	0.300	0.263	0.458
'F' test	Sig	Sig	Sig	Sig	Sig
<i>N (kg/ha)</i>					
0	0.266	0.333	0.342	0.289	0.477
50	0.300	0.351	0.393	0.339	0.548
100	0.300	0.293	0.396	0.356	0.512
'F' test	N S	Sig	Sig	Sig	Sig
SEm \pm	0.0134	0.0124	0.0091	0.0093	0.0200
CD (0.05)	0.0392	0.0362	0.0267	0.0273	0.0584

Table 3
Oil yield (kg/ha) at different harvests

Treatments	Harvests					Total
	I	II	III	IV	V	
<i>Varieties</i>						
RRL 16	10.13	13.70	14.13	14.00	4.58	56.54
SD 68	10.17	26.20	10.64	18.24	6.35	81.60
OD 19	9.73	21.66	22.56	17.44	6.75	78.16
'F' test	N S	Sig	Sig	Sig	Sig	Sig
<i>N (kg/ha)</i>						
0	8.11	16.46	14.30	13.75	5.34	57.96
50	10.87	22.31	19.65	15.03	6.08	73.94
100	11.05	22.78	23.37	20.90	6.26	84.36
'F' test	Sig	Sig	Sig	Sig	Sig	Sig
SEm±	0.761	1.522	1.537	1.006	0.532	4.673
CD (0.05)	2.277	4.440	4.488	2.937	1.552	13.640

Table 4
Citral content of oil (per cent) at different harvests

Treatments	Harvests			
	I	II	III	IV
<i>Varieties</i>				
RRL 16	79.0	76.8	77.3	82.0
SD 68	84.4	85.0	84.1	87.8
OD 19	83.5	80.1	80.7	85.8
'F' test	Sig	Sig	Sig	Sig
<i>N (kg/ha)</i>				
0	81.8	79.0	79.9	84.3
50	82.2	80.8	80.8	85.5
100	83.6	81.7	71.4	85.9
'F' test	N S	N S	N S	N S
SEm±	0.95	0.80	0.98	1.48
CD (0.05)	2.79	2.32	2.85	4.31

Grass yield increased progressively with increase in levels of nitrogen in all the harvests though significant difference in yield was noticed in second and third harvests and in the total yield. Higher levels of nitrogen had a tendency to increase the plant height and number of tillers and these might have led to the significant increase in grass yield. Nair *et al.*, (1976) also reported that increasing levels of nitrogen increased the grass yield of lemongrass. Effect of interaction was significant only during the second harvest (Table 5). The last harvest which coincided with the dry season recorded the lowest grass yield possibly due to the poor vegetative growth due to water stress.

There was significant variation among the varieties in oil recovery percentage in all the harvests and RRL 16 recorded the maximum. OD 19 and SD 68 were on par in oil content at the first, third and last harvests. Oil content was maximum during last harvest. Higher oil content of RRL 16 is due to the higher leaf:stem ratio of this variety.

Effect of nitrogen on oil content was significant in all the stages except in the first harvest. Levels of 100 kg N and 50 kg N/ha were on par and superior to control in third, fourth and fifth harvests. Effect of interaction was significant in all the harvests. RRL 16 with 100 kg N/ha recorded the maximum oil content during first and third harvests. During fourth and fifth harvests RRL 16 with 50 kg N/ha recorded maximum oil content.

The oil yield varied significantly among the varieties from the second harvest onwards. The total oil yield was also influenced by the varieties. RRL 16 in spite of having a higher oil content recorded a significantly lower oil yield. This is corroborated by its lower herbage yield. SD 68 and OD 19 were on par in total oil yield. This is in agreement with the findings of Sobti *et al.* (1979) who found that SD 68 had only a marginal lead over OD 19 in yield under Jammu conditions.

Effect of nitrogen on oil yield was significant upto the fourth harvest. Effects due to 50 kg N and 100 kg N/ha were on par and superior to 0 kg N/ha in total yield. Higher levels of nitrogen increased the grass yield and oil content compared to control. This might have increased the oil yield. Similar findings of increased oil yield, with higher levels of nitrogen have been reported in lemongrass by Nair and Nair (1977). Interaction between varieties and nitrogen was significant only in first, fourth and fifth harvests. SD 68 with 100 kg N/ha recorded the maximum oil yield. Fig. 1 reveals that SD 68 is a fertiliser responsive variety but under no nitrogen application OD 19 is found to be better.

The effect due to varieties on citral content varied significantly in all the four harvests. SD 68 recorded the highest citral content and RRL 16 recorded the lowest in all the harvests. SD 68 and OD 19 were on par in citral content during the first and fourth harvests. Effect of nitrogen on citral content in the oil was not significant. This is in agreement with the findings of Nair and Nair (1977). Interaction

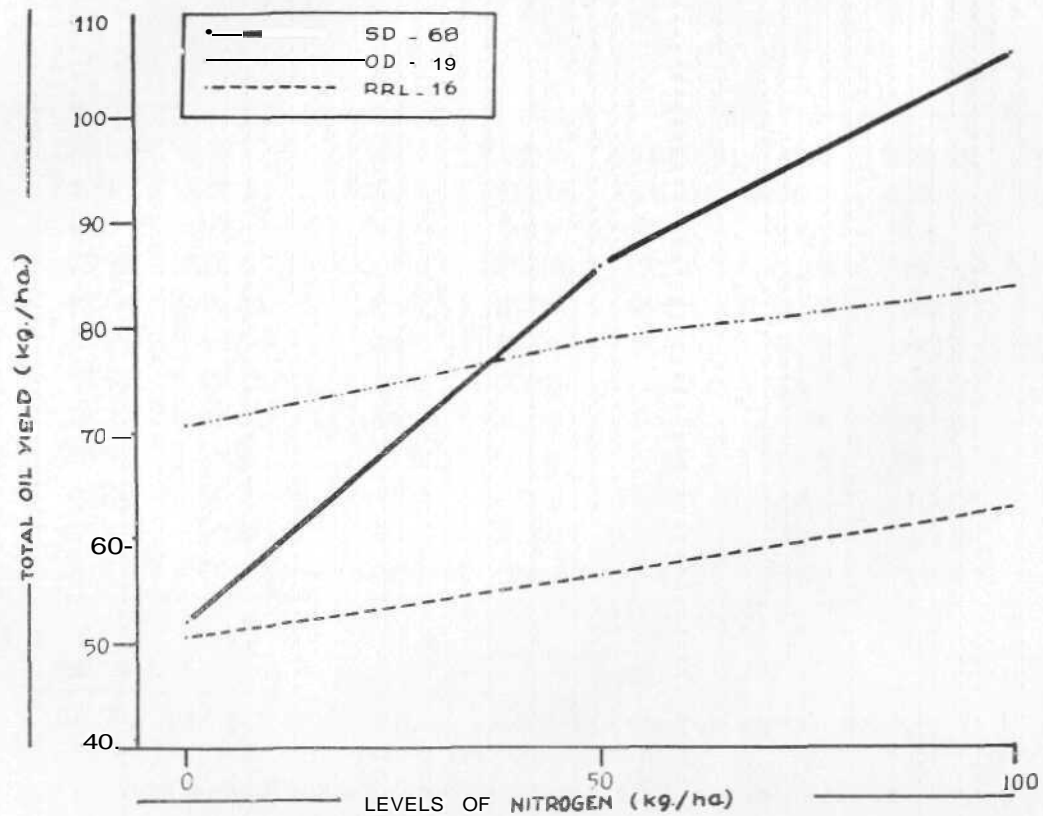


FIG. 1 OIL YIELD OF LEMONGRASS VARIETIES AT DIFFERENT LEVELS OF NITROGEN

Table 5

Effect of nitrogen on the grass, oil content and oil yield of lemongrass varieties

Treatment combinations	Grass yield (t/ha) II	Oil content of grass (per cent)					Oil yield (kg/ha)		
		Harvests					Harvests		
		I	II	III	IV	V	I	IV	V
v ₁ n ₀	3.91	0.401	0.303	0.465	0.457	0.493	9.32	13.26	4.03
v ₁ n ₁	3.59	0.423	0.420	0.554	0.565	0.681	9.01	14.80	4.75
v ₁ n ₂	4.38	0.475	0.369	0.579	0.427	0.654	12.06	13.93	4.95
v ₂ n ₀	4.79	0.162	0.432	0.237	0.143	0.470	6.46	9.68	4.36
v ₂ n ₁	7.79	0.232	0.364	0.371	0.232	0.456	10.72	16.47	6.11
v ₂ n ₂	10.84	0.263	0.286	0.287	0.329	0.481	13.33	28.57	8.58
v ₃ n ₀	6.58	0.234	0.262	0.324	0.268	0.468	8.55	18.32	7.62
v ₃ n ₁	8.85	0.244	0.268	0.253	0.219	0.506	12.90	13.82	7.39
v ₃ n ₂	10.04	0.161	0.223	0.322	0.302	0.400	7.77	20.20	5.27
'F' test	Sig	Sig	Sig	Sig	Sig	Sig	Sig	Sig	Sig
SEM ±	0.685	0.0233	0.0214	0.0158	0.0162	0.0346	1.322	1.742	0.921
CD (0.05)	2.003	0.0680	0.0627	0.0460	0.0473	0.1011	3.855	5.078	2.689

effect was not significant. Since the quantity of oil obtained from the fifth harvest was not sufficient, citral content was not estimated.

Summary

An experiment to study the effect of graded levelsof nitrogen on lemongrass varieties revealed that OD 19 and SD 68 were on par and significantly superior to RRL 16 in grass production and oil yield. RRL 16 recorded maximum oil content and minimum citral percentage. Effect of nitrogen on grass and oil yield was significant. Levels of 1 00 kg N and 50 kg N were on par and Superior to control in oil yield, but 50 kg N/ha was on par with 100 kg N/ha and control in the case of grass yield. Oil content was maximum at higher nitrogen levels compared to control in most of the harvests,

സംഗ്രഹം

പാക്യജനകത്തിന്റെ തോത് പുൽതൈലത്തിന്റെ ഉൽപാദനത്തെ എങ്ങനെ ബാധിക്കുന്നു എന്നു മനസ്സിലാക്കുവാൻവേണ്ടി, ഓടക്കാലി സുഗന്ധതൈല ഔഷധച്ചെടി ഗവേഷണ കേന്ദ്രത്തിൽ നടത്തിയ പരീക്ഷണങ്ങളിൽ നിന്നും ഹെക്ടറിന് 50 കി. ഗ്രാം പാക്യജനകം നൽകുന്നതാണ് ഏറ്റവും കൂടുതൽ ഉൽപാദനം തരുന്നതും ലാഭകരവുമെന്നു കാണുകയുണ്ടായി. നൂറു കിലോഗ്രാം പാക്യജനകം നൽകിയപ്പോഴും തൈലത്തിന്റെ ഉൽപാദനതോതിൽ ഗണ്യമായ മാറ്റം കണ്ടില്ല. a. ഡി. 19, എസ്. ഡി. 68 എന്നീ ഇനങ്ങൾക്ക് ആർ. ആർ. എൽ. 16 എന്ന ഇനത്തേക്കാൾ കൂടുതൽ തൈലം ഉൽപ്പാദിപ്പിക്കുവാൻ കഴിവുള്ളതായും കണ്ടു.

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