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Short Communication

Effect of a commercial growth promoter (trade name Vipul) on fenugreek and its root nodule bacteria

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Abstract

In vitro studies on fenugreek–*Rhizobium* showed that Vipul had neither promotive nor inhibitory effect on it. Vipul spray experiments on fenugreek plants revealed that a spray of 250 ppm of Vipul two times had significantly increased the length, dry matter, total N and P contents. However, it did not increase the nodule numbers nor promoted fenugreek–*Rhizobium* symbiosis.

Key words: Vipul, fenugreek–*Rhizobium*, symbiosis.

1. Introduction

Fenugreek (*Trigonella foenumgraecum* L) is an important spice crop of India[1]. This work was taken up to assess the effect of Vipul on the growth of fenugreek plants and on its root nodule bacteria *Rhizobium meliloti*. Vipul (*a/i* 5000 ppm), a plant growth promoter marketed by Godrej Soaps Ltd, Bombay, is an aqueous colloidal emulsion, milky white in colour and is soluble in water; its pH is neutral. It contains different types of alcohols. Triacontanol (24–26%), octacosanol (6–10%), dotriacontanol (11–15%) and tetratriacontanol (6–10%) form the major constituents. Triacontanol: mol. formula is $CH_3(CH_2)_{28}CH_2OH$; mol. wt is 438. Sterols, namely, betasitosterol ($C_{29}H_{59}O$). Stigmasitosterol and campesterol are also present but to a smaller extent, around 10%.

Phytohormones are known to influence nodulation of roots in legumes[2]. For example, it has been found that Indole acetic acid, a growth promoting phytohormone and Colchicine, a plant alkaloid, help in early nodulation in lucerne[3,4]. Of late, Triacontanol, a long-chain alcohol, which occurs naturally in plants such as alfa alfa, has gained importance as a plant growth promoter[5].

2. Materials and methods

The root nodule bacteria were isolated from healthy fenugreek plants collected from farmer's field as per the method of Vincent[6].

One ml of 72-hour old culture of the above isolated *Rhizobium* sp(log phase cells *ca* 4×10^6) was inoculated aseptically into 100 ml of sterile yeast extract mannitol broth in 250 ml flasks. To these, calculated quantities of Vipul were added aseptically in such a way that the final concentrations obtained were 0, 2, 10, 20 and 40 ppm of the compound. The flasks were incubated at room temperature ($30 \pm 2°C$) on rotary shaker. Two replicates were maintained for each concentration of the chemical. The growth of the *Rhizobium* isolate in culture was assessed at 450 nm (Elico colorimeter) at specified intervals.

Studies on the effect of Vipul on fenugreek plants were carried out on plants grown in red soil contained in polythene covers (25×18 cm). Here pH of the soil was 7.7, E.C. 1.4×10^3 millimhos; water-holding capacity 36.5%. Fenugreek seeds (Co 1 variety) pelleted with 72-hour old culture of *Rhizobium* using peat as the carrier and cooked starch as adhesive were sown in the above soil packs. The packets containing the 24-day old plants were grouped under four heads for 0, 250, 500 and 1000 ppm Vipul spray treatment. Vipul was hand-sprayed, on the 24th and 42nd day after sowing, in good weather conditions. Total length, nodule number and plant dry weight were recorded on 11, 18 and 28th day after the first spray treatment. The above values for each treatment (control, 250, 500, 1000 ppm) and for each interval (0, 11, 18, 28th days) are based on six plants spread over three soil packs. The experiment was conducted in triplicate.

Estimation of total nitrogen, total phosphorus, sodium and potassium was done as per standard procedures[7] on the 28th day after the first spray treatment.

3. Results and discussion

The bacteria showed steady and uniform growth over 72-hour incubation period in control as well as in treated broth without any appreciable difference (Table I).

Fenugreek plants that received the 250 ppm Vipul spray recorded the highest growth in terms of total length, dry matter, total nitrogen and phosphorus (Tables II and III). The plants that received 500 and 1000 ppm Vipul spray have recorded lower growth rate, dry matter and total N as compared to the untreated control plants in almost all these

Table I
In vitro* effect of Vipul on *R. meliloti
(Mean of two replicates; figures represent OD of culture)

Treatment (in ppm)	Hours							
	0	6	12	24	36	48	60	72
0 (Control)	0	0.03	0.15	0.25	0.34	0.38	0.42	0.44
2	0	0.03	0.17	0.27	0.35	0.40	0.43	0.44
10	0.02	0.05	0.16	0.25	0.32	0.36	0.42	0.43
20	0.03	0.05	0.15	0.24	0.30	0.32	0.41	0.43
40	0.03	0.04	0.16	0.24	0.30	0.36	0.43	0.40

Table II
Effect of Vipul spray on total length, nodule number and dry matter content
(Mean of six plants)

No. of days after I spray	Plant age (days)	Treatment (in ppm)	Total length per plant (cm)	% increase/ decrease over control	Nodule number per plant	% increase/ decrease over control	Dry weight per plant (g)	% increase/ decrease over control
0 (initial)	24	—	22.50	—	2.00	—	0.083	—
11	35	0	28.67	—	3.00	—	0.015	—
		250	33.17	+ 15%	5.00	+ 67%	0.183	+ < 1000
		500	29.17	+ 2	4.50	+ 50	0.183	+ < 1000
		1000	29.33	+ 2	4.17	+ 39	0.183	+ < 1000
18	42	0	43.00	—	8.67	—	0.350	—
		250	49.00	+ 14	9.67	+ 12	0.416	+ 19
		500	43.83	+ 2	10.83	+ 25	0.333	− 5
		1000	36.17	− 16	4.83	− 44	0.250	− 29
28	52	0	54.83	—	11.83	—	0.583	—
		250	56.00	+ 2	8.50	− 27	0.683	+ 17
		500	38.83	− 29	8.83	− 25	0.366	− 37
		1000	46.50	− 15	8.33	− 21	0.416	− 28

Table III
Effect of Vipul spray on total nitrogen, total phosphorus, potassium and sodium in 52-day old fenugreek plants
(based on two readings)

Treatment (in ppm)	Total Nitrogen (%)	Total Phosphorus (g/ml)	Pottassium (ppm)	Sodium (ppm)
0 (Control)	5.60	57.5	62.5	8.0
250	8.96	130.0	65.0	8.8
500	4.48	25.0	80.0	9.6
1000	5.04	62.5	67.5	8.0

treatments and intervals. However, as regards the potassium and sodium contents, the 500 ppm Vipul spray was found to be better than the other treatments and control plants (Tables II and III).

Any chemical compound sprayed over plant surface can act in more than one way. It can directly influence the plant growth or can be excreted partially at least, along with other substances as root exudate[8]. It is well known that root exudates have a profound effect on the rhizosphere microflora, rhizobial population in soil and also on nodulation. It is generally held that phytohormones such as IAA play an important role in nodule initiation[9].

Vipul has significant effect on the increase in dry weight, total length, total nitrogen and phosphorus, but it does not correlate with the increase in nodulation. Moreover as seen in Table I, Vipul does not have any promotive effect on the *in vitro* growth of fenugreek's *Rhizobium*. These facts would lead us to believe that the above increase in the fenugreek plants may be independent of the symbiotic effect of fenugreek–*Rhizobium*. Further plant physiological studies are needed to confirm this view.

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