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Insecticide Usage Pattern in Jasmine of Southern Tamil Nadu

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ABSTRACT

Jasmine cultivation is considered a quickly developing business in India. Jasmine is one of the oldest traditional flowers grown in India. It is infested by a number of insects and mite pests. Available scientific literature shows that not much information is available on insecticide usage pattern in jasmine. Hence, a region oriented study was undertaken to study the insecticide usage pattern of jasmine growers in Southern districts of Tamil Nadu, India. The results revealed that more than 50 percent of the farmers believed that jasmine budworm (100.00 %), blossom midge (73.33 %), red spider mite (66.67 %), and leaf webworm (63.33 %) are the notable important insect pests in jasmine. The major insect pests of jasmine warranting insecticide application in order of importance as perceived by the respondent farmers were, jasmine budworm (100.00 %) > blossom midge (73.33 %) > red spider mite (66.67 %) > leaf webworm (63.33 %) > thrips (50.00 %) and whitefly (30.00 %). The insecticides viz., cypermethrin 4 EC (100.00 %), imidacloprid 17.8 SL (88.95 %), fenpyroximate 5 EC (83.79 %), monocrotophos 36 WSC (83.14 %), and profenophos 50 EC (80.00 %) were the most applied insecticides on jasmine in Kanyakumari, Tirunelveli and Tuticorin districts of Tamil Nadu. High volume knapsack sprayer (40.69 %) was the widely used sprayer for spraying insecticides in the jasmine garden. Seventy-eight percent of the farmers relied solely on insecticide spray for the management of insect pests in jasmine and the rest of the farmers (23.66 %) were using panchagavya followed by neem product (15.03 %). The majority of the farmers (80.00 %) were not using surfactants along with insecticides. Jasmine growers mostly derived diagnostic advice and recommendation from Agro input dealer (42.87 %) which is located in nearby areas. Media like television (46.27 %), newspaper (31.70 %) and FM Radio (10.88 %) also provided pesticide recommendations to the jasmine farmers.

Keywords: *Jasmine, Insect pests, Insecticide usage pattern, Plant protection appliances, Surfactants, Organic pesticides, Resource persons, Mass media*

INTRODUCTION

Jasmine *(Jasminum sambac L.)* is an attractive important commercial crop in India. The importance of the jasmine flower is felt in all religious, social, and cultural ceremonies and other functions performed by all religious people. Tamil Nadu is the leading producer of jasmine in the country. Jasmine cultivation is considered a fast-growing business in India. The flowers produced in Tamil Nadu airlifted to other countries like Sri Lanka, Malaysia, Singapore, and Middle East countries. The least yield of jasmine products might be due to various reasons, among which the scourge by insect pests is of fundamental significance. The majority of the farmers assume that the only solution to pest problems is to spray different types of pesticides more frequently but some of the farmers had adopted pest management practices. Hence, the present investigation was undertaken to study the insecticide usage pattern of jasmine growers in Southern districts of Tamil Nadu, India.

Materials and Methods

The incidence of major insect pests in jasmine was recorded in three districts viz., Kanyakumari, Tirunelveli, and Tuticorin districts of Tamil Nadu, India. A survey was conducted to understand the pesticide use pattern of jasmine growers in Southern parts of Tamil Nadu through the structured interview schedule. The questionnaire was designed following [1] [2] with slight modifications to suit the local condition. A total of 90 farmers from Southern districts of Tamil Nadu were interviewed. The list of blocks covered has been given in Table 1.

Table 1. Sample distribution of jasmine farmers in three districts of Tamil Nadu

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S. No.	District	Name of the block	No. of farmers
1.	Kanyakumari	Killiyoor	12
2.		Munchirai	3
3.		Melpuram	8
4.		Thovalai	7
5.	Tirunelveli	Manur	5
6.		Sankarankovil	17
7.		Vasudevanallur	8
8.	Tuticorin	Thoothukudi	5
9.		Karungulam	6
10.		Srivaikundam	15
11.		Tiruchendur	4

Jasmine growers were randomly selected in each district and the data were collected using a structured interview schedule administered by personal interview. The interview schedule comprises the farmer's demographic information, literacy rate, extension agencies contact, social participation, cultivation practices, list of insect pests of jasmine and the insect pest which ranks first, the month of the severity of insect pest incidence, major pesticides applied, intervals of application, dosage, number of sprays, nature of insecticides used, time of pesticide application, type of plant protection appliances used, precautions taken while spray application and source of advice were included in the questionnaire and unknown insect pests faced by the jasmine growers [3]. The pesticide dependency of the farmers interviewed was worked out using the formula.

$$\text{Pesticide dependency (\%)} = \frac{\text{No. of farmers using a particular pesticide}}{\text{Total number of farmers}} \times 100$$

The insecticide use pattern of the jasmine farmers was assessed by tabulating the details on insect pests, names of the insecticides used, the surfactant used, resource persons, organic pest management practices adopted, plant protection appliances usage, sources of media for technology accession, *etc.*

Results and Discussion

In order to understand the plant protection knowledge of jasmine growers, a preliminary survey was conducted in the Tirunelveli, Tuticorin, and Kanyakumari districts of Tamil Nadu. The survey brought out information such as farmers' perception of the insect pest problems, insecticides and botanicals commonly applied by the jasmine growers, use of surfactants, and sources of their crop protection recommendations are presented in Tables 2 - 9.

Socio-economic characteristics of the farmers

Education level and farm size are one of the socio-economic characteristics for the farmer to adopt new technology. In terms of education level, the farmers were categorized into four groups such as illiterate, primary education (up to class five), secondary level (class six to ten), and above secondary level. On average, 44 percent of the farmers were at primary level and 21 percent were illiterate, while about 19 percent represent from the secondary level and 17 percent are educated i.e. above the secondary level.

The average farm size of jasmine growers in the southern district of Tamil Nadu was less than one hectare. Tirunelveli was much large (more than one hectare) (50 percent) than Tuticorin (33 percent) and Kanyakumari (27 percent). An average of 45 percent of the farmers were categorized as marginal farmers (Table 2).

Education level and farm size are the few socio-economic characteristics for the farmers to adopt new technology. Based on the results of the field survey undertaken in understanding the plant protection behavior of the jasmine farmers of the Southern region of Tamil Nadu, it is observed that irrespective of the educational qualification and size of the farm holding, the jasmine farmers solely depended on chemical insecticides for insect pests management in jasmine.

Table 2. Socio-economic status of jasmine farmers

S. No.	Particulars	No. of farmers			Respondents (%)			
		Kanyakumari	Tirunelveli	Tuticorin	Kanyakumari	Tirunelveli	Tuticorin	Average
I	Education (years of schooling)							
1.	Illiterate	7	7	5	23.33	23.33	16.67	21.11
2.	Primary school	10	14	16	33.34	46.66	53.34	44.45
3.	Secondary level	5	8	6	16.67	26.67	15.00	19.45
4.	Above secondary level	8	2	3	33.34	6.67	10.00	16.67
II	Category of farmers based on farm size (ha)							
1.	Marginal (less than 1 ha)	16	11	13	53.34	36.66	43.33	44.44

2.	Small (1 to 2 ha)	8	15	10	26.67	50.00	33.34	36.67
3.	Medium (2 to 10 ha)	6	4	7	20.00	13.34	23.33	18.89
4.	Large (more than 10 ha)	0	0	0	0.00	0.00	0.00	0.00

Farmer's perception on major insect pests of jasmine

The farmers opined that jasmine budworm, *Hendecasis duplifascialis* (Hampson); blossom midge, *Contarinia maculipennis* (Felt); leaf webworm, *Nausinoe geometralis* (Guenee); whitefly, *Dialeurodes kirkaldyi* (Kotinsky); lacewing bug, *Corythauma ayyari* (Drake); thrips, Isothrips orientalis (Bagnall) and red spider mite, *Tetranychus urticae* (Koch) were the important insect pests scourging their jasmine crop warranting insecticide application. More than 50 percent of the farmers believed that jasmine budworm (100.00 %), blossom midge (73.33 %), red spider mite (66.67 %), and leaf webworm (63.33 %) are the notable important insect pests in the study area, respectively. Almost one-third of the farmers reported that the thrips (50.00 %) and whitefly (30.00 %) are the important pests in jasmine (Table 3). The majority of the respondents considered the jasmine budworm as the major insect pest (Fig. 1). The importance of jasmine budworm as the major insect pest of jasmine causing severe economic loss was earlier recognized by [3].

Table 3. Farmer's perception on major insect pests in Jasmine

S. No.	Insect pests	Kanyakumari Respondents (n=30)		Tiruneveli Respondents (n=30)		Tuticorin Respondents (n=30)		Average (n=90)	
		Nos.	%	Nos.	%	Nos.	%	Nos.	%
1.	Blossom midge, *Contarinia maculipennis*	12	40.00	10	29.41	15	47.58	22	73.33
2.	Budworm, *Hendecasis duplifascialis*	25	83.33	30	100.00	28	90.52	30	100.00
3.	Lacewing bug, *Corythauma ayyari*	0	0.00	0	0.00	0	0.00	0	0.00
4.	Leaf webworm, *Nausinoe geometralis*	10	33.33	26	76.47	18	57.71	19	63.33
5.	Thrips, *Isothrips orientalis*	28	93.33	32	94.12	25	79.15	15	50.00
6.	Whitefly, *Dialeurodes kirkaldyi*	12	40.00	25	73.53	15	47.84	9	30.00
7.	Red spider mite, *Tetranychus urticae*	11	36.67	29	85.29	20	62.88	20	66.67
	Mean	14	46.67	21.71	63.87	17.38	55.10	16.43	54.76
	SD	9.54	31.80	12.01	35.32	10.41	33.12	9.68	32.25

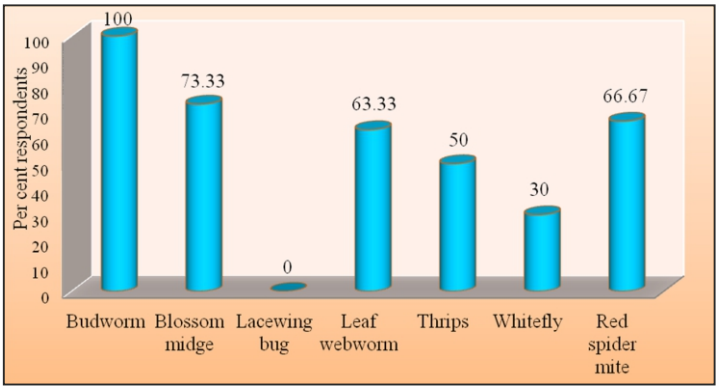

Fig. 1. Farmer's perception on major insect pests in Southern districts of Tamil Nadu

Pesticide use pattern on jasmine in Southern districts of Tamil Nadu

The insecticides commonly used by the farmers in the study area were: acephate 75 SP, acetamiprid 20 SP, bifenthrin 10 EC, cypermethrin 4 EC, chlorpyriphos 50 EC + cypermethrin 5 EC, deltamethrin 1 EC + triazophos 35 EC, dichlorvos 76 EC, diflubenzuron 25 WP, dimethoate 30 EC, emamectin benzoate 5 SC, fenpropathrin 30 EC, fenpyroximate 5 EC, fipronil 5 SC, imidacloprid 17.8 SL, lambda-cyhalothrin 5 EC, monocrotophos 36 WSC, novaluron 10 EC, permethrin 25 EC, profenophos 50 EC, pyriproxyfen 10 EC, sulfoxaflor 21.8 SL, triazophos 40 EC. The cypermethrin 4 EC was applied by most of the farmers (100.00 %) which was followed by imidacloprid 17.8 SL (88.95 %), fenpyroximate 5 EC (83.79 %), monocrotophos 36 WSC

(83.14 %), profenophos 50 EC (80.00 %), acephate 75 SP (75.23 %), triazophos 40 EC (61.67 %), emamectin benzoate 5 SC (57.39 %), bifenthrin 10 EC (57.12 %), lambda-cyhalothrin 5 EC (56.80 %), pyriproxyfen 10 EC (53.33 %), fipronil 5 SC (47.58 %), fenpropathrin 30 EC (43.34 %), permethrin 25 EC (43.33 %), dichlorovos 76 EC (40.65 %), diflubenzuron 25 WP (39.94 %), novaluron 10 EC (36.67 %), dimethoate 30 EC (31.37 %), chlorpyriphos 50 EC + cypermethrin 5 EC (29.61 %), acetamiprid 20 SP (21.08 %), sulfoxaflor 21.8 SL (20.00 %), deltamethrin 1 EC + triazophos 35 EC (12.29 %) (Table 4).

The majority of the farmers assume that the only solution to pest problems is to spray different types of pesticides more frequently [4] but some of the farmers had adopted pest management practices like application of manure and fertilizer after pruning and time of harvest. Farmers who were aware of the recommended pesticides for budworm, blossom midge, and red spider mites have used pesticides to control the pests [5].

Table 4. Pesticide use pattern on jasmine in Southern districts of Tamil Nadu

S. No.	Insecticides used	Kanyakumari Respondents (n=30)		Tiruneveli Respondents (n=30)		Tuticorin Respondents (n=30)		Average (n=90)	
		Nos.	Insecticide dependency %	Nos.	Insecticide dependency %	Nos.	Insecticide dependency %	Nos.	Insecticide dependency %
1.	Acephate 75 SP	21	70.00	28	82.35	22	73.33	24	75.23
2.	Acetamiprid 20 SP	-	-	3	8.82	10	33.33	7	21.08
3.	Bifenthrin 10 EC	22	73.33	5	14.71	25	83.33	17	57.12
4.	Cypermethrin 4 EC	30	100.00	-	-	-	-	30	100.00
5.	Chlorpyriphos 50 EC + Cypermethrin 5 EC	-	-	2	5.88	16	53.33	9	29.61
6.	Deltamethrin 1 EC + Triazophos 35 EC	2	6.67	8	23.53	2	6.67	4	12.29
7.	Dichlorovos 76 EC	18	60.00	12	35.29	8	26.67	13	40.65
8.	Diflubenzuron 25 WP	14	46.67	9	26.47	14	46.67	12	39.94
9.	Dimethoate 30 EC	9	30.00	15	44.12	6	20.00	10	31.37
10.	Emamectin benzoate 5 SC	17	56.67	20	58.82	17	56.67	18	57.39
11.	Fenpropathrin 30 EC	23	76.67	-	-	3	10.00	13	43.34
12.	Fenpyroximate 5 EC	28	93.33	22	64.71	28	93.33	26	83.79
13.	Fipronil 5 SC	19	63.33	10	29.41	15	50.00	15	47.58
14.	Imidacloprid 17.8 SL	28	93.33	25	73.53	30	100.00	28	88.95
15.	Lambda-cyhalothrin 5 EC	26	86.67	16	47.06	11	36.67	18	56.80
16.	Monocrotophos 36 WSC	21	70.00	27	79.41	30	100.00	26	83.14
17.	Novaluron 10 EC	5	16.67	-	-	17	56.67	11	36.67

18.	Permethrin 25 EC	13	43.33	-	-	13	43.33	13	43.33
19.	Profenophos 50 EC	18	60.00	-	-	30	100.00	24	80.00
20.	Pyriproxyfen 10 EC	-	-	-	-	16	53.33	16	53.33
21.	Sulfoxaflor 21.8 SL	-	-	-	-	6	20.00	6	20.00
22.	Triazophos 40 EC	10	33.33	-	-	27	90.00	19	61.67
	Mean	15.43	51.43	14.42	42.41	16.48	54.92	15	49.59
	SD	7.97	26.57	8.93	26.28	9.14	30.47	9	27.77

Plant protection appliances usage by jasmine farmers

High volume (HV-Knapsack sprayer) alone (40.69 %) was the widely used sprayer followed by knapsack and power sprayers (35.10 %) and battery-operated sprayers alone (26.47 %). Only a few were using low volume (LV- motorized knapsack power sprayer) alone (10.33 %) (Table 7). According to [1], motorized knapsack power sprayer (69.57 %) was the widely used sprayer followed by high-volume knapsack sprayers (17.39 %) and few farmers (13.04 %) used motorized knapsack sprayers as well as high volume knapsack sprayer (Table 5).

Table 5. Plant protection appliances usage by jasmine farmers

S. No.	Plant protection appliance	Kanyakumari		Tiruneveli		Tuticorin		Average (n=90)	
		Respondents (n=30)		Respondents (n=30)		Respondents (n=30)			
		Nos.	%	Nos.	%	Nos.	%	Nos.	%
1.	HV (Knapsack sprayer) alone	20	66.67	5	14.71	-	-	13	40.69
2.	Battery operated sprayer alone	5	16.67	10	29.41	10	33.33	8	26.47
3.	LV - motorized knapsack power sprayer alone	2	6.67	6	17.65	2	6.67	3	10.33
4.	Knapsack and power sprayers	3	10.00	12	35.29	18	60.00	11	35.10
	Mean	7.5	25.00	8.25	24.26	7.5	25.00	8	24.75
	SD	8.43	28.09	3.30	9.72	8.23	27.42	7	21.74

*** HV – High volume; LV – Low volume**

Usage of adjuvant by jasmine growers

Surfactants viz., Sandovit®, Indtron®, Phytowet®, and Apsa®, were used by only 20.00 per cent of the farmers. The majority of the farmers (80.00 %) were not using surfactants along with insecticides (Table 6).

Table 5. Usage of adjuvant by jasmine growers

S. No.	Adjuvant	Kanyakumarimari		Tiruneveli		Tuticorin		Average (n=90)	
		Respondents		Respondents		Respondents			
		Nos.	%	Nos.	%	Nos.	%	Nos.	%

1.	Adjuvant used by the farmers	4	13.33	23	67.65	8	26.67	12	20.00
2.	Adjuvant - Not used by the	26	86.67	11	32.35	22	73.33	20	80.00
	Mean	15	50.00	17	50.00	15	50.00	16	50.00
	SD	15.56	51.85	8.49	24.96	9.90	33.00	11	36.60

Synthetic and non-synthetic insecticides used in jasmine

Seventy-eight percent of the farmers (Fig. 2) relied solely on insecticide spray for the management of insect pests in jasmine and the rest of the farmers (23.66 %) were using panchagavya followed by neem product (15.03 %) (Table 7). Azadirachtin was found to be commonly used as an insecticide generally in combination with chemical pesticides. The majority of farmers generally tend to use a combination of one or more pesticides on the basis of their effectiveness and cost. Extension agencies should intensify their efforts to organize extension educational programs to motivate farmers to accept and adopt IPM practices [3].

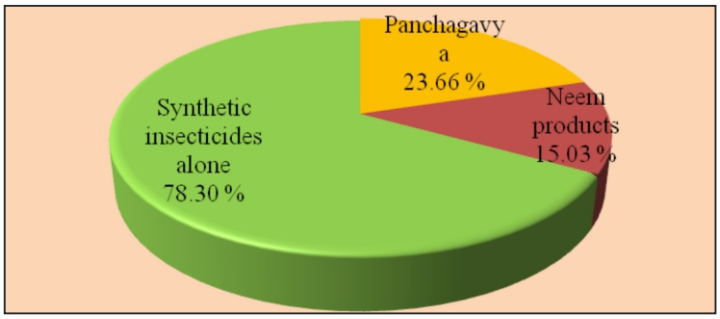

Fig. 2. Synthetic and non-synthetic insecticides used on jasmine

Table 7. Synthetic and non-synthetic insecticides used in jasm

S. No.	Substance	Kanyakumari Respondents (n=30)		Tiruneveli Respondents (n=30)		Tuticorin Respondents (n=30)		Average (n=90)	
		Nos.	%	Nos.	%	Nos.	%	Nos.	%
1.	*Panchagavya*	1	3.33	15	44.12	8	23.53	8	23.66
2.	Neem products	10	33.33	2	5.88	2	5.88	5	15.03
3.	Synthetic insecticides alone	29	96.67	24	70.59	23	67.65	25	78.30
	Mean	13.33	44.44	13.67	40.20	11	32.35	13	39.00
	SD	14.29	47.65	11.06	32.53	10.82	31.81	12	37.33

Resource persons accessed by jasmine growers

The jasmine growers of the survey area reported that they received diagnostic advice and recommendation from the input dealers (42.87 %) (Fig. 3). The extension officials (17.58 %) and Agri. Clinics (16.67 %) supported one-third of the farmers. The remaining farmers diagnosed their problems through neighbours (11.96 %) and media (2.22) (Table 8). [6] [7] reported that farmers involved in spraying used mainly the retail shop owners as the information source for knowledge regarding the pesticides they used (58.30 %).

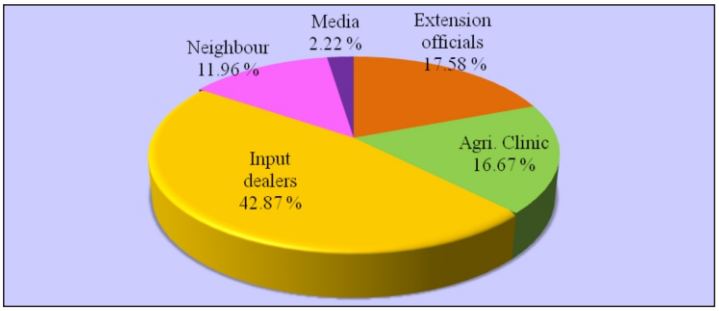

Fig. 3. Resource persons accessed by jasmine growers

Table 8. Resource persons accessed by jasmine growers

S. No.	Resource Persons	Kanyakumari Respondents (n=30)		Tiruneveli Respondents (n=30)		Tuticorin Respondents (n=30)		Average (n=90)	
		Nos.	%	Nos.	%	Nos.	%	Nos.	%

1.	Extension officials	2	6.67	10	29.41	5	16.67	6	17.58
2.	Agri. Clinic	5	16.67	-	-	10	33.33	5	16.67
3.	Input dealers	16	53.33	12	35.29	12	40.00	13	42.87
4.	Neighbour	7	23.33	2	5.88	2	6.67	4	11.96
5.	Media	1	3.33	-	-	1	3.33	1	2.22
	Mean	6.2	20.67	4.8	14.12	6	20.00	6	18.26
	SD	5.97	19.92	5.76	16.95	5	16.67	6	17.68

The major sources of information for use of pesticides by farmers were based on notifications by television, radio broadcasting, leaflets, and pamphlets that were made available from agrochemical shops and also through agricultural officers, sales representatives from various agrochemical companies [8] [9] [10].

Media accessed as a source of technology by jasmine growers

Media like newspapers, as well as television, provided pesticide recommendations for 77 percent of the farmers. Of the media accessed, the preferred one was television (46.27 %) followed by a newspaper (31.70 %). Only 14.77 % of the farmers depended on All India Radio and FM Radio (10.88 %) as a source of pesticide recommendations for the management of insect pests in jasmine (Table 9).

Table 9. Media accessed as a source of technology by jasmine growers

S. No.	Media	Kanyakumari Respondents (n=30)		Tiruneveli Respondents (n=30)		Tuticorin Respondents (n=30)		Average (n=90)	
		Nos.	%	Nos.	%	Nos.	%	Nos.	%
1.	Newspaper	15	50	4	11.76	10	33.33	10	31.70
2.	Television	12	40	20	58.82	12	40.00	15	46.27
3.	All India Radio	3	10	6	17.65	5	16.67	5	14.77
4.	FM Radio	-	-	4	11.76	3	10.00	4	10.88
	Mean	7.5	25	8.5	25	7.5	25.00	8	25.00
	SD	7.14	23.80	7.72	22.72	4.20	14.01	6	20.18

The findings of the present study lend support to those of [1] [2]. The present study brought out the importance of FM Radio as one of the hitherto unexplored media for the dissemination of plant protection messages. The results from this study will definitely help to improve the outreach program of the extension officials especially dissemination of crop protection technology by means of field days, group meetings, demonstrations, and mass media, especially FM Radio.

Conclusion

Based on the results of the field survey undertaken in understanding the plant protection behavior of the jasmine farmers of the Southern region of Tamil Nadu, it is observed that the jasmine farmers solely depended on chemical insecticides for insect pest management in jasmine. The majority of the respondents considered budworm as the major insect pest in jasmine. The present study brought out the importance of FM Radio as one of the hitherto unexplored media for the dissemination of plant protection messages.

Future scope of the study:

The results from this study will definitely help to improve the outreach program of the extension officials especially dissemination of crop protection technology by means of field days, group meetings, demonstrations, and mass media, especially FM Radio.

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Conflict of interest

The authors declare that they have no conflict of interest in the publication.

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