

A Scientific study and analysis of incidence and intensity of bark eating caterpillar (*Inderbela* spp.) in Guava Tree (*Psidium guajava*)

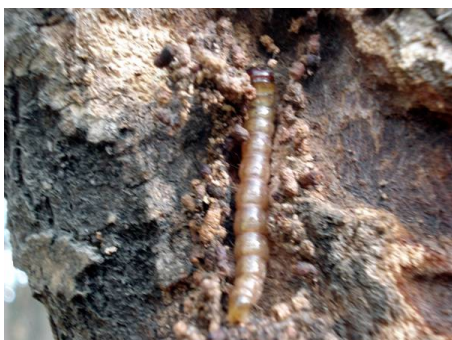
Dr. Sunita Arya¹, Dr. Rajesh Kr Dubey²

¹Associate Prof. Department of Zoology, DG P.G. College, Kanpur (U.P.) India

²Director, UGC-HRDC, JNVU, Jodhpur, Rajasthan, India

ABSTRACT: Bark eating caterpillar (*Inderbela* spp.) is a polyphagous pest found on citrus, mango, guava, jamun, luquat, mulberry, litchi etc. *Inderbela tetranis* and *Inderbela quadrinotata* have been recorded boring the bark and feeding inside. Older trees and the trees in orchards that are not well maintained are more prone to these pests. Peak activity period of this pest is September to October. Eggs are laid under loose bark or in raks and crevices in cluster of 15-30 from April to June. Incubation period 8-12 days. Larval period of 9-10 months pupal period is 3-4 weeks. It consist one generation per year. Larvae make holes on the stem and branches. Newly hatched larval feed on the bark which cover-up with the dark ribbon like silken web made of wood chips ad excreta pellets.

KEYWORDS: Indesbela sp., Incidence, Intensity, Infestation, Population.



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I. INTRODUCTION

Guava is one of the most refereed and legendary fruit because of its hardy and positive bearing nature, high vitamin C content and more income with minimum inputs (Singh, 2010). About 80 spp. of insect pests have been recorded on guava but only few of them had been identified as pest of regular occurrence and causing serious damage. These are bark eating caterpillar (*Indesbela* spp.), fruitfly (*Bactrocera* spp.) and scale insect (*Chloropulvinaria psidii*). The bark eating caterpillar had wide distribution, Larva bores into the trunk or branches about 15-25 cm of depth. Tunnel created a empty in day time, but filled with caterpillar during the night. It starts damaging bark of the tree resulting dieback of the stem. Frass visible in affected area (Anon, 2016).

II. MATERIALS AND METHODS

Experiments were carried out in river bed area of guava orchards, C.S.A. University of Agriculture and Technology, Kanpur and D.G. College, Kanpur. Intensity was observed in five varieties of guava i.e. Allahabad Safeda, Lucknow 49, Apple Colour, Red flesh and local seedlings. The observation of the host range were taken throughout the study period and even a single ribbon was considered. The observation on the colour of frass ribbon was also taken. The presence of frass ribbon on trees with freshly eaten bark was considered as the sign of infestation. For quantifying the intensity and infestation number of active holes/infested trees were counted which later was converted into the index of caterpillar incidence as per the method given by Verma and Khurana (1976) and Atwal and Singh (1990).

$$\text{Index of caterpillar incidence} = \frac{\text{Percent trees infested} \times \text{mean no. of active holes}}{100}$$

III. RESULTS AND DISCUSSION

Host range : The observations recorded on the host range of the best indicated that in all, there were 17 plant specie attacked by the pests of which 6 belonged to fruit category and 11 to forest and avenue plantation. Earlier, Bhalla and Pawar (1977) reported a number of host plants of *Inderbela* sp. from the Himanchal Pradesh. Tandon and Lal (1978) also studied and found infestation of the pests on 33 plant species distributed across 18 genera and 19 families. Verma and Khurana (1978) recorded as many as 70 plant species as the host plants of *Inderbela* species from Haryana. The data collected on the colour the ribbon varied between chocolate brown, brown to light brown. The colour of frass ribbon was found to be influenced by the colour of tree bark.

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Table 1: Host range of bark eating caterpillar, *Inderbela* sp. in Uttar Pradesh.

Common name	Scientific name	Colour of frass ribbon
Citrus	<i>Citrus reficulata</i>	Light brown
Litchi	<i>Litchi chinensis</i>	Chocolate brown
Guava	<i>Psidium guajava</i>	Light brown
Mango	<i>Mangifera indica</i>	Chocolate brown
Jamun	<i>Syzygium cumini</i>	Light brown
Aonla	<i>Embelica officinalis</i>	Brown
Asoka tree	<i>Saraca asoca</i>	Light brown
Bottle brush	<i>Callistemon lanceolantus</i>	Light brown
Gulmohar	<i>Delonix regia</i>	Light brown
Arjun	<i>Terminalla arjuna</i>	Light brown
Kikar	<i>Acacia nilotica</i>	Dark brown
Encalyptus	<i>Eucalyptus ciriodora</i>	Chocolate brown
Khair	<i>Acaecia catechu</i>	Light brown
Kachnar	<i>Bauhinia variegata</i>	Light brown
Mulberry	<i>Morus alba</i>	Light brown
Peepal	<i>Ficus religiosa</i>	Light brown
Poplar	<i>Populus deltooides</i>	Light brown

Table 2: Incidence and intensity of bark eating caterpillar *Inderbela* spp. on major fruit crops at Kanpur.

Crop	Incidence	No. of Active holes/tree	Index of caterpillar incidence
Guava	97.5	6.2	6.04
Citrus	92.3	4.04	3.72
Litchi	96.4	4.25	4.09
Mango	90.8	2.10	1.90
Jamun	83.5	1.35	1.12
Aonla	80.4	1.12	0.90

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Fig. 1 : Incidence and intensity of bark eating caterpillar *Inderbela* spp. on major fruit crops at Kanpur.

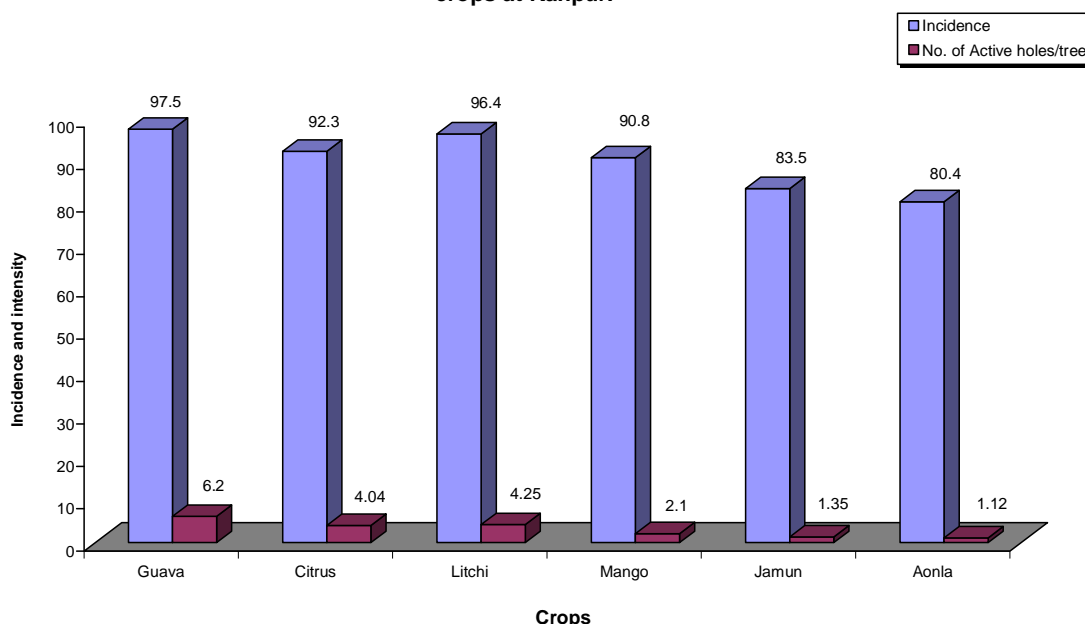


Table 3 : Incidence and intensity of bark eating caterpillar *Inderbela* spp. in young and old orchards of Guava, mango and citrus.

Crop	Status	Infestation %	Average no. of Active holes/tree	Index of caterpillar incidence
Guava	Young (<6 yrs)	22.0	2.5	0.55
	Young (>15 yrs)	88.9	6.2	5.51
Mango	Young (<6 yrs)	15.8	1.5	2.37
	Young (>15 yrs)	78.3	2.1	1.64
Citrus	Young (<6 yrs)	19.5	1.65	0.32
	Young (>15 yrs)	80.5	4.40	3.54

Incidence and intensity : Data of the incidence and intensity of the *Inderbela* sp. on major fruit crop (Table-2 and Fig. 1) revealed that Guava crop have maximum incidence 97.5 per cent and Aonla have minimum 80.40 per cent. However, Litchi, citrus and mango showed 96.4, 92.3 and 90.8 per cent incidence. Number of active holes varied from 1.12 to 6.2 per tree in Aonla to Guava fruit crop citrus and Litchi also showed significant results and 4.04 and 4.25 holes per tree, respectively.

Thakur and Thakur (1998), reported on an average 4.6 to 7.4 holes on Plum. Index of caterpillar incidence was found 6.045 in Guava and followed by 4.09 (Litchi), 3.72 (Citrus) and 1.90 (mango). Earlier Verma and Khurana (1976) reported 20-100 per cent incidence of pest of different fruit crops from Haryana. The observations recorded on relative incidence on young and old orchards (Table-3 and Fig. 2-3) of Guava, mango and citrus indicated that the incidence and intensity of the pest, *Inderbela* sp. was very high in old orchards compare to their counter part. Infestation was found high 88.9, 80.5 and 78.3 per cent in guava, citrus and mango crop, respectively in old (>15 yrs) orchards. However, it was 22.0, 19.5 and 15.8 per cent in Guava, citrus and mango crop in new (< 6 yrs) orchards, respectively. Shivanker and Rao (2004) reported about 20 percent infestation in young (5-10 yrs) trees of Nagpur Mandarin and 49.2

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percent in older trees (> 16 yrs) in healthy orchards whereas, in the declining orchards the respective values were 48.1 and 76.16 percent which correlate with present findings. Similar results were found by Mann and Bindra (1978) Lakra (1999) and Balikai *et al.* (2011) and Gupta *et al.* (2014) at different parts of country.

It is clear from the data of Table-4 and the table of Analysis of variance that the 'F' value for the varieties is highly significant at 0.1 per cent level and this indicated that all the five varieties differ from one another significantly. The 'F' value for the periods was differ from one another significantly, interaction effects of the varieties and the periods was also significant. This indicated that the varietal effect significantly used to changing from period to period.

Among 45 periods of population of *Inderbela* spp. was the highest 38.839 per unit in the 4th week of December. The minimum population was observed (10.815) per unit in the 1st week of January. The maximum varietal mean was recorded (27.629 per unit) in cv. Allahabad Safeda and followed by (27.273) in L-49, (25.053) in Red flesh and (22.154) in Apple colour guava. Shashidheran and Varma (2008) studied seasonal population of *Inderbela* spp. in Tamilnadu and found significant correlation between population and climatic change. Firake *et al.* (2013) also found similar results in their investigation.

Table 4 : Intensity of Bark Borer *Inderbela tetraonis* (Moore) with period and period x crops means.

Months/weeks		Allahabad Safeda	Lucknow 49	Apple Colour	Red Flesh	Local Seedling	Period Mean
		V ₁	V ₂	V ₃	V ₄	V ₅	
July 2010	I	0.554 (27.651)	0.612 (32.997)	0.330 (10.508)	0.379 (13.653)	0.348 (11.637)	0.445 (18.488)
	II	0.561 (28.315)	0.612 (32.981)	0.346 (11.525)	0.398 (14.991)	0.348 (11.637)	0.453 (19.154)
	III	0.569 (28.990)	0.636 (35.313)	0.348 (11.637)	0.433 (17.619)	0.348 (11.637)	0.467 (20.257)
	IV	0.572 (29.326)	0.647 (36.314)	0.354 (11.988)	0.455 (19.270)	0.369 (12.989)	0.479 (21.254)
Aug. 2010	I	0.583 (30.326)	0.647 (36.314)	0.354 (11.988)	0.471 (20.602)	0.393 (14.644)	0.490 (22.105)
	II	0.590 (30.991)	0.657 (37.316)	0.364 (12.663)	0.480 (21.283)	0.407 (15.646)	0.500 (22.944)
	III	0.598 (31.663)	0.664 (37.988)	0.383 (13.990)	0.516 (24.332)	0.425 (16.992)	0.517 (24.445)
	IV	0.594 (31.327)	0.671 (38.658)	0.393 (14.664)	0.531 (25.661)	0.408 (15.738)	0.519 (24.640)
Sept. 2010	I	0.601 (31.997)	0.674 (38.989)	0.407 (15.664)	0.535 (25.996)	0.463 (19.975)	0.536 (26.097)
	II	0.612 (32.997)	0.654 (36.998)	0.463 (19.975)	0.539 (26.332)	0.480 (21.320)	0.550 (27.283)
	III	0.623 (33.998)	0.657 (37.333)	0.484 (21.654)	0.550 (27.332)	0.535 (25.948)	0.570 (29.092)
	IV	0.626 (34.328)	0.675 (38.999)	0.542 (26.635)	0.572 (29.329)	0.535 (25.983)	0.590 (30.952)
Oct. 2010	I	0.63 (34.666)	0.675 (38.999)	0.605 (32.317)	0.591 (30.997)	0.550 (27.325)	0.610 (33.803)
	II	0.640 (35.666)	0.685 (39.999)	0.640 (35.666)	0.601 (31.997)	0.561 (28.325)	0.625 (34.275)
	III	0.647 (36.333)	0.681 (39.659)	0.661 (37.666)	0.623 (33.998)	0.580 (29.987)	0.638 (35.491)
	IV	0.664 (37.998)	0.702 (41.664)	0.678 (39.333)	0.643 (35.992)	0.583 (30.329)	0.654 (37.018)
Nov. 2010	I	0.576 (29.659)	0.656 (37.225)	0.685 (39.994)	0.654 (36.998)	0.622 (33.938)	0.639 (35.521)

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	II	0.601 (31.975)	0.657 (37.250)	0.619 (33.640)	0.621 (33.869)	0.608 (32.643)	0.621 (33.864)
	III	0.633 (34.945)	0.678 (39.308)	0.612 (32.993)	0.636 (35.235)	0.601 (31.997)	0.632 (34.875)
	IV	0.643 (35.967)	0.671 (38.665)	0.591 (30.997)	0.646 (36.267)	0.633 (34.998)	0.637 (35.358)
Dec. 2010	I	0.650 (36.641)	0.661 (37.666)	0.619 (33.661)	0.661 (37.663)	0.633 (34.998)	0.645 (36.118)
	II	0.671 (38.652)	0.661 (37.657)	0.647 (36.329)	0.678 (39.333)	0.654 (36.998)	0.662 (37.791)
	III	0.664 (37.998)	0.671 (38.637)	0.668 (38.330)	0.688 (34.330)	0.644 (35.998)	0.667 (38.252)
	IV	0.678 (39.319)	0.685 (39.994)	0.657 (37.250)	0.678 (39.319)	0.668 (38.326)	0.673 (38.839)
Jan. 2011	I	0.373 (13.309)	0.316 (9.630)	0.271 (7.133)	0.353 (11.952)	0.363 (12.619)	0.335 (10.815)
	II	0.388 (14.311)	0.332 (10.649)	0.284 (7.874)	0.351 (11.829)	0.401 (15.246)	0.351 (11.849)
	III	0.397 (14.974)	0.332 (10.649)	0.314 (9.564)	0.378 (13.624)	0.463 (19.975)	0.377 (13.560)
	IV	0.397 (14.974)	0.354 (11.988)	0.321 (9.940)	0.392 (14.627)	0.476 (20.983)	0.388 (14.313)
Feb. 2011	I	0.407 (15.655)	0.359 (12.317)	0.363 (12.593)	0.402 (15.278)	0.496 (22.660)	0.405 (15.538)
	II	0.434 (17.664)	0.364 (12.640)	0.373 (13.309)	0.406 (15.588)	0.520 (24.656)	0.419 (16.570)
	III	0.438 (17.9993)	0.369 (12.989)	0.388 (14.311)	0.438 (17.947)	0.535 (25.983)	0.433 (17.637)
	IV	0.418 (16.447)	0.383 (13.990)	0.398 (14.991)	0.455 (19.270)	0.546 (26.965)	0.440 (18.127)
		V ₁	V ₂	V ₃	V ₄	V ₅	
March 2011	I	0.472 (20.665)	0.374 (13.330)	0.416 (16.314)	0.458 (19.586)	0.605 (32.317)	0.465 (20.101)
	II	0.488 (21.995)	0.388 (14.330)	0.420 (16.656)	0.475 (20.947)	0.601 (31.956)	0.475 (20.882)
	III	0.492 (22.321)	0.393 (14.664)	0.463 (19.975)	0.483 (21.596)	0.619 (33.628)	0.490 (22.154)
	IV	0.508 (23.655)	0.402 (15.330)	0.480 (21.326)	0.483 (21.606)	0.636 (35.207)	0.502 (25.153)
April 2011	I	0.516 (24.332)	0.420 (16.622)	0.484 (21.654)	0.486 (21.833)	0.629 (34.636)	0.507 (23.580)
	II	0.524 (24.996)	0.416 (16.296)	0.554 (27.643)	0.494 (22.466)	0.643 (35.975)	0.526 (25.204)
	III	0.539 (26.324)	0.428 (17.259)	0.507 (23.614)	0.522 (24.887)	0.643 (35.992)	0.528 (25.388)
	IV	0.550 (27.310)	0.459 (19.652)	0.550 (27.297)	0.533 (25.847)	0.654 (36.993)	0.549 (27.250)
May 2011	I	0.535 (25.996)	0.480 (21.320)	0.571 (29.163)	0.544 (26.780)	0.647 (36.329)	0.555 (27.790)
	II	0.543 (26.665)	0.504 (23.332)	0.508 (23.655)	0.563 (28.441)	0.657 (37.329)	0.555 (27.757)
	III	0.557 (27.985)	0.516 (24.332)	0.546 (26.996)	0.590 (30.963)	0.668 (38.330)	0.576 (29.618)
	IV	0.546	0.531	0.561	0.587	0.681	0.581

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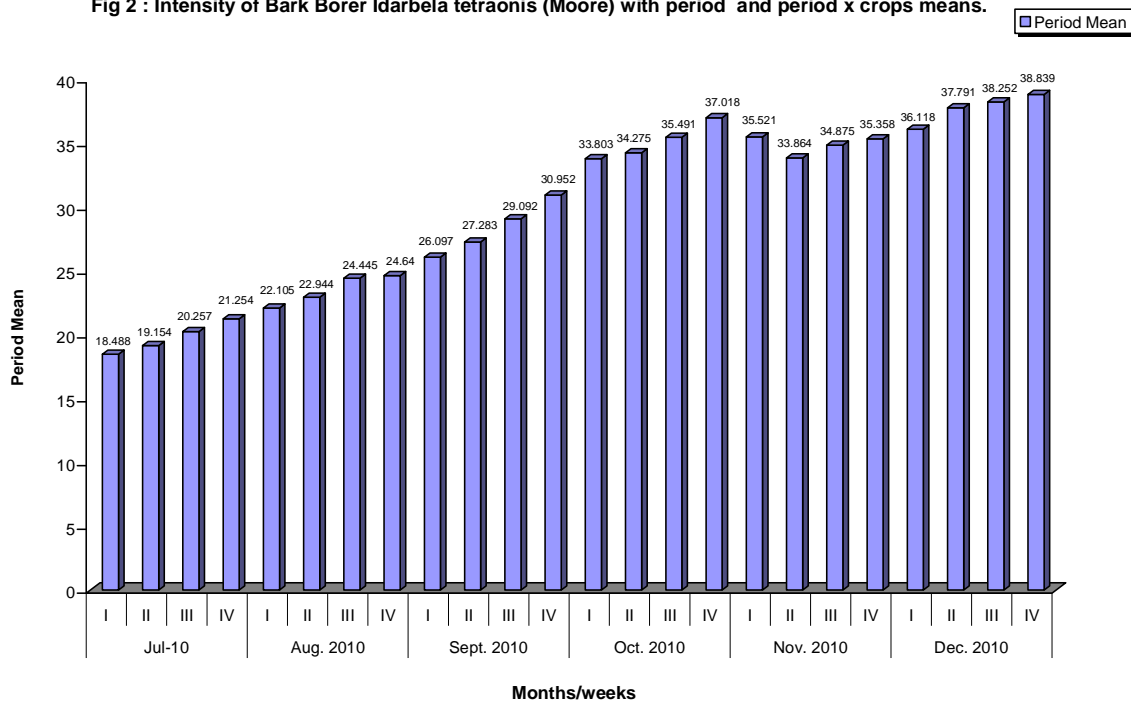
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		(26.974)	(25.665)	(28.325)	(30.654)	(39.661)	(30.154)
June 2011	I	0.554 (27.651)	0.572 (29.329)	0.565 (28.658)	0.548 (27.159)	0.685 (39.994)	0.585 (30.469)
	II	0.565 (28.635)	0.591 (30.997)	0.569 (28.990)	0.526 (25.226)	0.692 (40.664)	0.588 (30.794)
	III	0.568 (28.954)	0.601 (31.997)	0.580 (29.987)	0.541 (26.557)	0.688 (40.330)	0.596 (31.480)
	IV	0.579 (29.960)	0.605 (32.332)	0.591 (30.997)	0.576 (29.701)	0.671 (38.649)	0.604 (32.288)

Note: Figures in Parenthesis are transformed back value.

Fig 2 : Intensity of Bark Borer *Idarbela tetraonis* (Moore) with period and period x crops means.



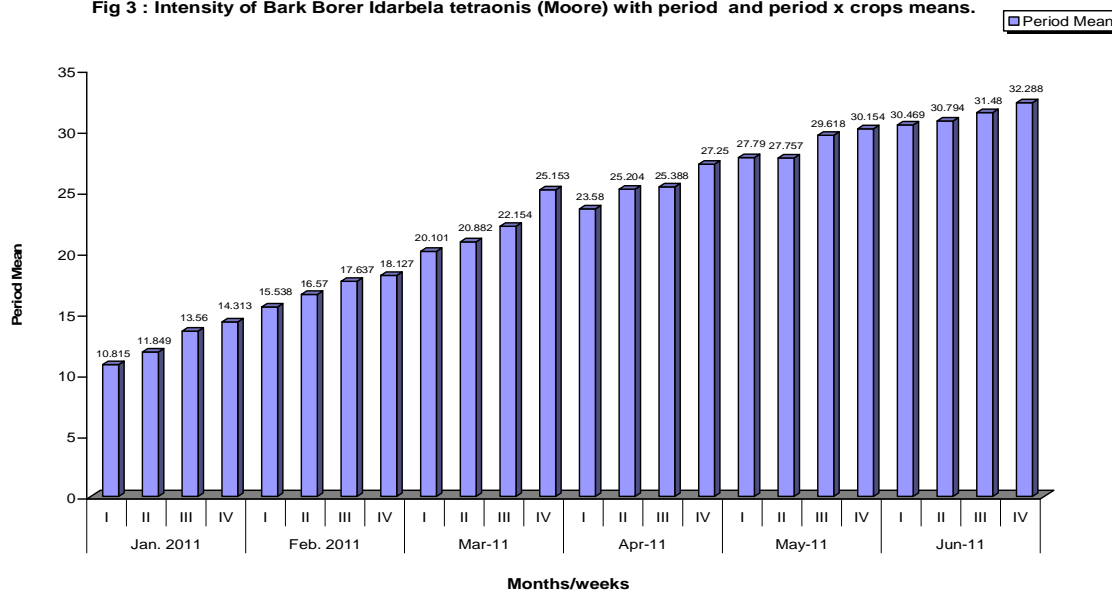
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Fig 3 : Intensity of Bark Borer *Inderbela tetraonis* (Moore) with period and period x crops means.



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