

**POPULATION SIZE OF A WEED, *LANTANA CAMARA* L.
IN THE UNDERSTOREY OF TEAK FORESTS OF ANAIMALAIS,
WESTERN GHATS AS INFLUENCED BY UPPER CANOPY COVER**

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Introduction

The variation in the size of any plant population over a period of time depends on many intrinsic (adaptiveness, reproductive fitness and persistence) and extrinsic (physical, soil and other organisms) factors (Dobzhansky, 1968). The clear understanding of the population behaviour in relation to environmental conditions is a prerequisite to regulate the population growth in stable ecosystems (Odum, 1961). The present study deals with the population dynamics of a noxious, exotic weed, *Lantana camara* in three different disturbed teak forests.

Study area

The present study was carried out in the teak plantations of Topslip (latitude 10° 32' 8" N and longitude 77° 4' 23" E), Western Ghats, Tamil Nadu. The altitude of the study area ranges between 800 and 1,300m above msl. The temperature generally ranged between 12°C and 29°C. The average annual rainfall is *ca.* 1,500 mm and the relative humidity varies between 60 and 92% over the year. The soil is deep and sandy loam with acidic

pH. Fire occurs during summer in grassy patches of the study area is usually prevented from the entry into plantations effectively (Wilson, 1964).

The vegetation is moist deciduous type. Teak plantations of various age series since the year 1940, occupy major area in Topslip. Tamil Nadu State Forest Department maintains the forests and by selective felling method then harvests the mature trees once in six years. Owing to heavy disturbance and trampling, some plantations were destroyed by elephants even at the early stages. In such disturbed areas, the exotic weeds like *Lantana camara*, *Eupatorium odoratum*, *Parthenium hysterophorus* etc. have distributed dominantly. In the closed and open forests also these weeds commonly occur at sub-canopy level with varied ecological features. Elephants, Great Indian gaur, Sambhar, Nilgiri tahr, Tiger, Leopard, Wild boar, Wild dog etc. are the common wild animals found in the study area.

Material and Methods

From the teak forests, three experimental sites, each having various

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degree of disturbance were taken for the present study. The site I, which extends over an area of *ca.* 50 ha, was an undisturbed 30 years old teak plantation, planted during the year 1967, where canopy was open only during autumn. The site II was a disturbed teak plantation of 45 years old one, planted on the year 1952 and spreads over an area of *ca.* 75 ha in which selective felling was done by the Tamil Nadu State Forest Department at six years interval and the site III was a 20 years old degraded forest planted during the year 1972, spread over an area of *ca.* 25 ha. It is an open habitat in which elephants destroyed saplings at early stage through trampling activities. All the three sites are in close proximity located adjacent to each other.

In each site, 20 permanent quadrats of 1 m² were delineated. In case of adults, each plant with a height of 30 cm (1 foot) was considered as an individual. For the study of seedling population, seedling cohorts were marked in each of the five permanent quadrats in April month of 1997 and 1998. Individuals arising from the rhizome and seeds were marked with point of different colours. The survival of adults and seedlings was recorded at monthly intervals. The study on the population dynamics of the weed, *Lantana camara* was carried out according to the method of Wankhar and Tripathi (1993) over a period of 25 months from January, 1997 to January, 1999, and the results were expressed in 100 m² scale.

Results and Discussion

The density of the weed, *Lantana camara* varied considerably across the sites and ranged between 1.3 and 12.6/m² during the period of study (Table 1). The results

Table 1

*Changes in population density of
Lantana camara (±SD) in
three different disturbed teak forests.*

Year and Month	Density (individuals/m ²)					
	Site I		Site II		Site III	
1997						
Jan.	1.3	0.2	2.5	0.2	3.0	0.2
Feb.	1.4	0.3	2.6	0.3	3.3	0.3
March	1.5	0.2	2.6	0.2	3.4	0.3
April	1.7	0.2	3.2	0.3	3.8	0.3
May	1.6	0.3	3.3	0.3	4.0	0.3
June	2.5	0.3	4.9	0.4	5.5	0.4
July	2.9	0.5	5.9	0.5	9.0	0.6
Aug.	3.2	0.3	7.6	0.6	11.5	0.9
Sept.	3.3	0.2	8.0	0.6	12.6	0.9
Oct.	3.3	0.4	7.8	0.7	12.0	1.1
Nov.	3.0	0.3	7.4	0.5	10.5	1.1
Dec.	1.5	0.1	4.5	0.5	6.8	0.8
1998						
Jan.	1.3	0.1	2.7	0.2	3.8	0.2
Feb.	1.3	0.2	2.5	0.2	3.9	0.2
March	1.4	0.3	2.6	0.2	3.7	0.3
April	1.5	0.3	2.8	0.3	4.0	0.3
May	1.4	0.2	3.0	0.3	4.2	0.4
June	1.3	0.2	3.3	0.3	6.1	0.6
July	1.5	0.1	3.7	0.4	8.8	0.7
Aug.	1.9	0.1	5.3	0.4	11.8	0.8
Sept.	2.3	0.2	7.4	0.6	12.4	0.6
Oct.	2.1	0.2	7.2	0.5	11.8	0.7
Nov.	1.5	0.1	6.1	0.6	10.2	0.8
Dec.	1.3	0.1	3.0	0.2	6.5	0.5
1999						
Jan.	1.5	0.1	3.3	0.2	4.7	0.2

Site 1 - Undisturbed teak forest with closed canopy; Site II - Disturbed teak forest with randomly open canopy; Site III - Degraded teak forest with open canopy at all places.

of the study revealed that high degree of disturbance happened in the forest systems concomitantly enhanced the population of *Lantana camara*. Contrary to this, Senthilkumar *et al.* (2003) reported that the exotic weed, *Eupatorium odoratum* increased its population in protected forests of Anaimalais, Western Ghats against the disturbed forests. Tripathi and Diwedi (1978) explained that the habitats developed with biotic disturbances are generally suitable for some specific weed plants. Froud-Williams *et al.* (1984) and Solbrig *et al.* (1988) pointed out that the disturbance stimulates seed germination and clonal growth by exposing the respective reproductive parts to light and air. The intensive light tolerating capacity and better growth performance in open sun and degraded lands may also be the reason for the higher density of exotics like *Lantana camara* in disturbed sites (Bjorkman, 1968; Reddy and Aruna, 1997).

The population growth of *Lantana camara* was proceeded upto the month of October in all the three sites and mainly it has been performed through rhizome sprouting (Fig. 1). Khoshoo and Mahal (1967) reported that the presence of excellent potentials like rapid vegetative reproduction helps the species for stronger establishment. Mathew (1972) pointed out that *Lantana camara* does not produce large quantities of seeds as the composite exotic weeds do and propagates mainly through hardy root suckers. The mortality of seedlings was generally higher than the adults. Abrahamson (1980) stated that the clonal multiplication seems to be favoured in environments where seed and seedling mortality are high. The greater survivorship of ramets (individual produced by vegetative reproduction) in natural populations as observed in

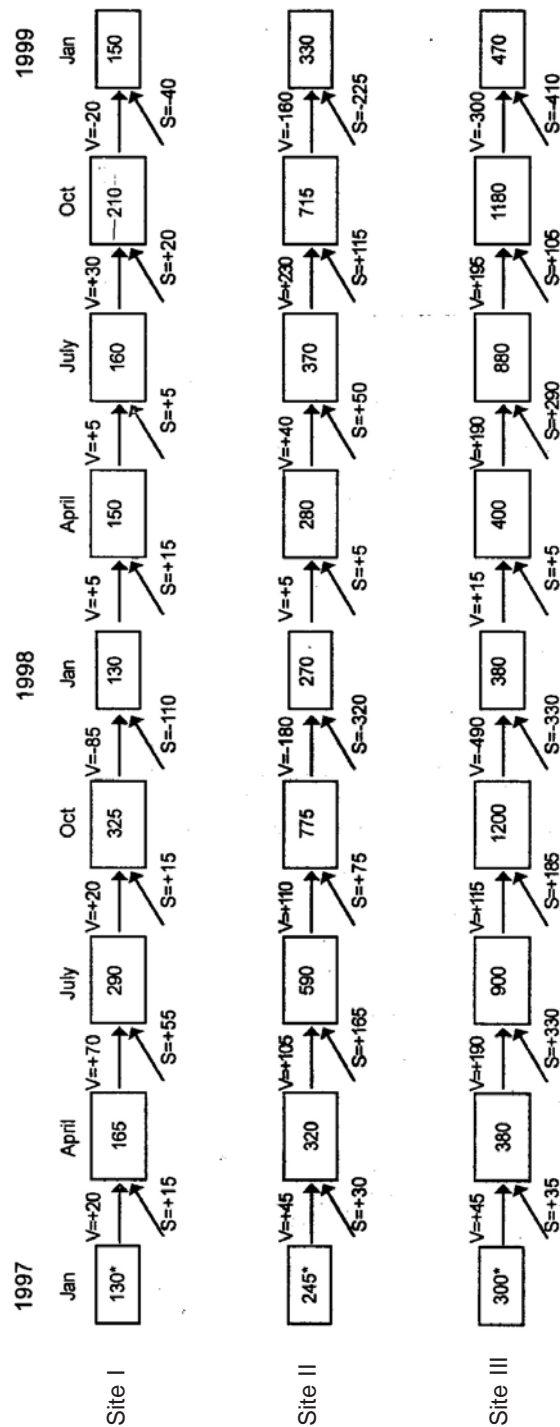
Lantana camara may be attributed to a physiological integration of ramets via translocation of resources such as water, minerals and photosynthate from the parent plants (Alpert and Mooney, 1986).

The percentage increase of population size of *Lantana camara* for a period of 25 months was significantly higher in disturbed and degraded forests over those of the undisturbed ones (Table 2). Ramakrishnan (1991) pointed out that open habitat with reduced competition, created by a high degree of disturbance is an important requirement for successful colonization and population growth of exotic weeds. Further, it was noted that significantly higher number of individuals of *Lantana camara* were present in degraded site (site III) than the disturbed site (site II) over the study period. This may be attributed that open canopy with exposed habitat encouraged the migration and germination of many weed species (Singh and Tripathi, 1992; Senthilkumar, 2000). Swamy and Ramakrishnan (1987) also stated that the exotic weeds get success as the disturbance proceeds due to their high adaptability.

Conclusion and Recommendation

The overall ecological attributes of the weed, *Lantana camara* in various studied forests indicates that it achieved least success in the undisturbed forests of Anaimalais. Hence, for the control of this weed, the forest canopy must be kept in closed condition through high degree of habitat protection and sustainable utilization as well. In addition, before adopting the weed control measure, studies on the effect of *Lantana camara* on forest productivity are suggested for effective management.

Fig. 1



Schematic summary of the population flux of *Lantana camara* on undisturbed (site I), disturbed (site II) and degraded (site III) forest in the study area during January, 1997 - January, 1999.

Numbers in boxes refer to the population density (plants/100m²) and numbers written along the arrows refer to the population recruited vegetatively (V) and through seedlings (S) +, gain, - loss.

P > 1% (means of January, 1997 are compared with those of January, 1999).

Table 2

Rate of recruitment of individuals and population increase of Lantana camara in three different disturbance gradient forests.

Experimental site	Population size (plants/100m ²)		Natality (%)			Mortality(%) after 25 months			Population increase per 100 individuals over 25 months
	Jan 1997	Jan 1999	by vegetative method	by seedlings	Total	Individuals from vegetative reproduction	Seedlings	Total	
Undisturbed teak forest with close canopy (site I)	130	150	115.38	96.15	211.53	80.77	115.38	196.15	15.38 ^a
Disturbed teak forest with randomly open canopy (site II)	245	330	218.37	179.59	397.96	138.78	222.45	361.23	34.69 ^b
Degraded forest of open habitat without tree canopy (site III)	300	470	250.00	316.67	566.67	263.33	246.67	510.00	56.67 ^c

Values followed by same letter in last column are not significantly according to DMRT at 5% level.

SUMMARY

The population dynamics of an exotic weed, *Lantana camara* were studied over a period of 25 months in disturbance gradient teak forests of Topslip, Western Ghats. The density of *Lantana camara* was higher in degraded site at all times of sampling and it varied between 1.3 and 12.6/m² across the forest sites. The population size increased significantly as the disturbance proceeded. Hence, for control of this weed in forest systems, creation and maintenance of closed canopy are suggested through intensive habitat protection.

अनेमलै भूभाग, पश्चिमी घाट प्रदेश के सागौन वनों के उपरि वन के छात्रावरण से प्रभावित हुए अधोवन में *लैण्टाना कैमारा* लि० खरपतवार का संख्या आकार एस० पाउलसामी, एस० पद्मावती, एस० थंगराज पान्नेरसेल्वम व डी० सेंथिलकुमार सारांश

लैण्टाना कैमारा, परदेशीय खरपतवार की संख्या गतिकी का अध्ययन टॉपस्लिप, पश्चिमी घाट प्रदेश के विक्षुब्ध प्रवण सागौन वनों 25 महीनों तक किया गया। *लैण्टाना कैमारा* का घनत्व न्यादर्शन करने के सभी समय पर व्याहसित स्थल में अधिक रहता पाया गया और इसका अन्तर इन वन स्थलों में 1.3 से लगाकर 12.6/मी² तक रहता मिला। जैसे-जैसे विक्षोभ में वृद्धि होती गई संख्या आकार भी इसका काफी बढ़ता गया। अतः वन

प्रणालियों में इस खरपतवार का नियन्त्रण करने के लिए सघन प्राकृतावास रक्षण करके संवृत वितान बनाने और उसे निरन्तर बनाए रखने का सुझाव दिया जाता है।

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