possible to show that by plotting $(n'-n)/(\log n'/2^{n'} - \log n/2^{n})$, with n_{exp} in appropriate order will give a distribution similar to Figure 3, where $\log n'/2^{n'}$ are primes, i.e. $n' = 6, 10, 14, 21$, etc.

In an earlier publication[2] it was shown that the parameter n is related to the strength of interactions and that $\log_{10} n/2^{n}$ is related to prime numbers. These two aspects of the present model are brought together to allow for a wider interpretation of the experimental results.

Courant and Robbins[3] had shown that for any set S which has n elements, there are 2^{n} elements consisting of the set $[T]$ of all sub sets T of S, and as n tends to infinity 2^{n} implies continuity, i.e. cardinality 2, though n is discrete. Cantor[4] in 1893 had considered the possibility of using discreteness and continuity in the description of physical laws. He believed that while masses were discrete, the continuity between them was caused by 'aether'.

From the above studies using equation (1), and some aspects of number theory that discreteness and continuity as described by the ratio of the discreteness of the n's and the continuous spread of $n/2^{n}$, which is directly connected with the width and lifetimes of fundamental particles, the flavours of fundamental particles can be directly obtained. As we have seen earlier[1], we can also predict the behaviour of beta dacay and the energy levels of light nuclei. The appearance of primes also seems to suggest that further application of reductionism to fundamental particles is not possible.

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RAJA RAMANNA

National Institute of Advanced Studies, Bangalore 560 012, India

Carboxylesterase activity associated with organophosphate resistance in *Helicoverpa armigera* (Lepidoptera: Noctuidae) in Tamil Nadu

Helicoverpa armigera is a serious pest of several economically important crops, including cotton and legumes, in most regions of the Indian subcontinent. Consistent use of insecticides for the control of this insect has resulted in the development of resistance to a number of these[1–3]. This resistance has been characterized as being due to target site insensitivity, penetration resistance, and enhanced metabolic detoxification[4–6]. The enzymes involved in metabolic resistance include three major groups; mixed function oxidases, glutathione-S-transferases, and esterases. Several reports indicate that carboxylesterase is the major enzymatic factor for organophosphate resistance[7–9]. The present study was undertaken to examine the relationship between carboxylesterase and organophosphate resistance in populations of *H. armigera* collected from different areas of Tamil Nadu. Such information could be used in the management of *H. armigera* control programmes enabling development of strategies for overcoming resistance to insecticides.

H. armigera larvae were collected from bhendi fields at Coimbatore, Erode, Dindigul, and Madurai districts of Tamil Nadu state. These larvae were cultured in the laboratory on bhendi fruits for two generations. Bioassay and enzyme activity were carried out from these larvae.

The resistance levels were estimated by determining the LC_{50} values of monocrotophos and quinalphos for different populations separately by standard bioassay methods[10] and then comparing the LC_{50} values of the most susceptible population with those of other populations (LC_{50} of Erode–Dindigul–Madurai population/LC_{50} of Coimbatore population).

Fourth instar larvae of same size and age taken from different populations were homogenized individually with 20 mM phosphate buffer (pH 8.0), using a homogenizer and centrifuged at 10,000 g for 10 min. The carboxylesterase activity was spectrophotometrically assayed by the method of Van Aspem[11] and Devonshire[12] with some modifications from supernatant solution. A standard reaction mixture consisted of 100 µl of enzyme, 125 µl of α-naphthylacetate solution (1 mM) and 1.15 ml of 20 mM phosphate buffer (pH 8.0). The mixture was incubated at room temperature for 30 min. The reaction was stopped by addition of 125 µl of coupling reagent (mixture of Fast blue B salt and SDS), and the absorbance was taken at 605 nm after 15 min using a spectrophotometer. The amount of α-naphthol released by carboxylesterase was calculated using standard graph. Protein was measured by the method of Markwell *et al.*[13].

The LC_{50} values indicated that, the Madurai population was highly resistant to both insecticides compared to the Coimbatore population (Table 1). This might be due to the frequent application of these insecticides by the farmers of this area, regardless of the pest intensity and also perhaps due to the adaptation of the insect to sublethal doses. Similar results were reported by several workers[14–16].

The carboxylesterase activity was also observed to be highest (3 fold) in the populations collected from Madurai and it was at a moderate level in the populations collected from both Dindigul and Erode areas. The difference between the recorded values is statistically significant (ANOVA at 5% level) and this may

Table 1. Resistance level and carboxylesterase activity of *H. armigera* populations collected from various locations in Tamil Nadu

		Population			
		Coimbatore	Erode	Dindigul	Madurai
LC_{50} value (%)	Monocrotophos	0.00181	0.00300	0.00356	0.00817
	Quinalphos	0.00151	0.00428	0.00514	0.00528
Resistance level	Monocrotophos	–	1.66	1.97	4.51
	Quinalphos	–	2.83	3.40	3.50
Level of carboxylesterase	Specific activity	20.2 ± 0.84^a	24.9 ± 1.12^b	45.7 ± 1.11^c	61.9 ± 0.51^d

LC_{50} = Lethal concentration to give 50% mortality.
Resistance level = LC_{50} of resistance population/LC_{50} of most susceptible population (Coimbatore population).
Specific activity = nm/min/mg protein. [Mean values followed by different letters are significantly different ($P < 0.05$: SNK test)].

be possibly due to the occurrence of variable biotypes in different regions and the variation in resistance/susceptibility status of these populations. Carboxylesterases have been shown to be implicated in the metabolism of organophosphate[7–9].

The results demonstrate that the populations collected from Madurai had higher level of resistance to both the monocrotophos and quinalphos, and also show an increased degree of carboxylesterase activity, thereby indicating a close association between resistance to organophosphate and elevated level of carboxylesterase[7–9].

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P. MANIKANDAN*
S. RAVISANKAR**

**Entomology Research Institute, Loyola College, Chennai 600 034, India*
***PG and Research Department of Zoology, Kongunadu Arts and Science College, Coimbatore 641 029, India*

Detection of antibacterial activity in the floral petals of some higher plants

Resistance towards prevailing antibiotics having become widespread among bacteria and fungi, new class of antimicrobial substances are urgently required. It is well known that plants, although lacking the typical immune response, have an in-built system for protection against biotic and abiotic stress conditions. Since plants have co-evolved with pathogens, they understandably have also developed the chemical protection pathways against the parasitic organisms. Therefore, it is reasonable to expect a variety of plant compounds with specific as well as general antimicrobial activity and antibiotic potential[1]. In fact, there are several studies which reveal the presence of such compounds with antimicrobial properties in various plant parts[2–5].

The bioactive substances in plants are produced as secondary metabolites[6], which may not only be developmental stage-specific but also organ and/or tissue-specific. While plant leaf, stem and root extracts have been widely evaluated for bioactive compounds, screening of plant flower and seed has not been extensive. Earlier in a study, we reported detection of antibacterial activity in the seeds of some coprophilous plants[7]. The