

## Studies on a Few Proprietary Preparations of Benzene Hexachloride (BHC)

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Benzene hexachloride (BHC) — ( $C_6H_6Cl_6$  — hexachlorocyclohexane) was discovered by 1941 in France to have high insecticidal properties. This formulation is built up of mainly five isomers, of which the 'Gamma isomer' (constituting about 10–12%) possesses outstanding lethal properties against insects (Slade 1945).

BHC was available in commercial quantities in India by about 1947 and has shown much promise in the control of a number of major pests. The demand for this insecticide in plant protection has increased considerably during recent years. It may be interesting to note that the quantity distributed by the department alone during 1953–54 in the residuary State of Madras worked to about 900 tons, not to speak of the purchases made by the farmers from outside agencies. A number of firms are at present importing this chemical from abroad and are putting the same on the market under various trade names, without any authorised tests being conducted regarding the claims made for their products. The Planning Commission in their report on the First five Year Plan have rightly pointed out the need for organised guidance regarding the use of pesticides by competent agencies of the Government after due investigations in this regard.

In this note, the data gathered on the analysis of nine samples representing three proprietary brands of BHC as well as a gist of the results obtained in biological tests are furnished.

(i) Analytical Tests: Random samples of the different formulations were taken from consignments received from time to time at this institute for research purposes. These were got analysed for percentage of technical BHC contents and also gamma isomer contents, wherever possible, by the kind courtesy of the Plant Pathologist at the laboratory of the Plant Quarantine and Fumigation Station (Government of India), Bombay. The results are furnished as an Appendix.

(ii) **Biological Tests:** The insecticidal efficacy of the three brands specified above was also assessed simultaneously. To mention just a few instances, these investigations were conducted both under laboratory as well as field conditions against the cholam earhead bug—*Calacoris angustatus* L, chillies thrips—*Scirtothrips dorsalis* H. — the red cotton bug — *Dysdercus cingulatus* F, the tobacco thrips — *Thrips tabaci* L —, the castor semilooper — *Achoea janata* L —, the tobacco caterpillar — *Prodenia litura* F —, the ear-head blister beetle — *Lytta tenuicollis* P and the sunhemp flea beetle — *Longitarsus belgaumensis* G. The dusts were used as such while the wettable powders were tried at two concentrations, viz., one pound in 6.5 and 13 gallons of water (0.1 and 0.05% gamma BHC spray).

As a detailed account of the experiments conducted against the above pests and the data gathered, falls entirely outside the purview of the present paper only a gist of the technique followed and the results obtained are furnished below.

(a) **Laboratory Tests:** The technique adopted in these tests is that of the direct spraying with the help of an atomiser, or dusting method with the use of a piece of fine muslin. The test insects, mentioned above, were collected as and when they appeared in a pest form, in suitable containers. These were subsequently introduced into glass jars (8" x 4" size) and treated at the concentrations indicated in the above paragraph. The treated insects were made to remain in contact with the spray fluid or the dust for about five minutes, after which time they were transferred to fresh glass jars and fed with their normal food. Counts regarding the mortality of the test insects were recorded after an interval of 48 hours.

(b) **Field Tests:** The field investigations were mainly intended to check up the observations made in the course of the laboratory trials. Infested crops, were treated at the rate of about sixty gallons of the spray fluid or about 20–25 lb. of the dust per acer, whenever the above mentioned test insects occurred in a pest form. The insect population was estimated before and forty eight hours after the treatment by examining random samples, of affected parts of the plants, so as to cover two per cent of the experimental area. As it would be impossible to make a record of the dead insects, under field conditions, the efficacy of the three different brands was assessed with reference to the reduction in the population of the pest, after the treatment.

The percentage of mortality in the case of the laboratory trials and the reduction in the percentage of the pest population in the course of the field trials, ranged from 92–100 under the three brands.

**Conclusions:** From the analytical data presented in the appendix and judged by the results of the biological tests conducted in this State, it is evident that there is very little difference in the comparative merits of the three proprietary products of BHC that were tested, viz., "GAMMEXANE", "HEXAMAR" and "HEXIDOL". The individual variations in the gamma isomer content of a particular concentration, amongst the three brands, are quite insignificant. The choice, therefore, lies in the price factor.

It is expected that in the interest of maintaining the reputation of the firms concerned, they would stick up to the standards presented above and would not lower the quality of the products in their eagerness to offer a lower quotation.

#### REFERENCES

1. .. .. Fourth Report of the Expert Committee of Insecticides — No. 54 — p. 41. Published by World Health Organisation.
2. Geritt Dragt (1948) *Analytical Chemistry*: 20 (9): pp. 737.
3. Shepard (1951) *Chemistry and action of insecticides*: McGraw Hill Book Company, New York.
4. Slade, R. (1945) The gamma isomer of hexachlorocyclohexane (Gammexano), an insecticide with outstanding properties — *Chemistry and Industry*: 40: pp. 314–319.

## APPENDIX

*Results of analysis of three proprietary brands of BHC.*

Name of proprietary preparation	Technical BHC content	Gamma isomer content	Ph. of carrier
BHC (Gammexane) D025 — Imperial Chemical Industries	5.2%	0.70%	7.2
Hexamar BHC 5%—Bharat Pulverising Mills	4.8%	0.65%	7.3
Hexidol 805 — Geigy Insecticides	5.3%	0.71%	7.1
BHC (Gammexane) D120 — Imperial Chemical Industries	9.8%	1.34%	7.3
Hexamar BHC 10%—Bharat Pulverising Mills	9.6%	1.32%	7.2
Hexidol 810 — Geigy Insecticides	10.1%	1.36%	7.2
BHC (Gammexane) P520 — Imperial Chemical Industries	49.9%*	(a)	
Hexamar BHC 50% wettable powder — Bharat Pulverising Mills	49.10%*	(a)	
Hexidol 950 — Geigy Insecticides	50.52%*	(a)	

*Note:* (\*) BHC content — (W/W basis).

- (a) The gamma isomer content of the wettable powders is not determined, as on extraction of the wettable powder the technical BHC so obtained is always mixed with the other organic chemicals (like the wetting agent) used in the formulation of the powder. The wettable powders are upto specifications with regard to wettability, suspensibility and acidity as set down by World Health Organisation in their Fourth Report of the "Expert Committee on Insecticides".

*Method of analysis:* Two methods are followed for the estimation of the gamma isomer content. Both are polarographic methods, but differ from each other only in the method of preparation of the solution of the technical BHC for polarography. The methods are described in detail in the references (1 and 2) cited.