Calcium in the food, salt and fæces was estimated by the method of McCrudden.[1] Urinary calcium was measured according to the method of Shohl and Pedley.[2] The data on calcium intake excretion, and balance are given in the above table.

From the above data it is seen that in the case of crude salt, all the subjects excepting one, are on the safe side of positive calcium balance with an average of +142 mg. balance, while in the case of refined salt three out of six subjects show negative balance, the average calcium balance being only +10 mg.

These findings show that the crude common salt is a useful source of calcium and can partly supplement the South Indian rice diet which is deficient in that essential mineral.

The various samples of crude salt have been analysed by us for the calcium content, the calcium content varies from 0·48—0·72 gm. per 100 gm. of the salt.

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* The composition of the diet was 675 gm. of polished rice ; 40 gm. thur dhal ; 10 gm. Bengal gram ; 200 gm. vegetables, *i.e.*, potatoes, brinjals, onions ; 1 oz, of groundnut oil ; and *a small amount of spices, tamarind* and *chillies* (Tamarind 25 gm., dry chillies 12 gm. and other spices 10 gm.)

1. McCrudden, F. H., *Jour. Biol. Chem.*, 1911-12, **10**, 187. 2. Shohl, A. T., and Pedley, F. C., *Ibid.*, 1922, **50**, 537.

COMMERCIAL D.D.T. AS AN INSECTICIDE ON SUGARCANE CROP

D.D.T. (Dichloro-diphenyl-trichloro-ethane) as sold in the market is dissolved in kerosene oil or its emulsion with water and is intended primarily for use against mosquitoes and other domestic insect-pests such as cockroaches, bed-bugs, etc. Recently some firms have put for sale their own brand and claim beneficial effects for them against certain crop insect-pests such as leaf-hoppers. Early in September last, one such preparation diluted with water to 0·3% concentration was used against pyrilla on sugarcane at Motipur (District Muzaffarpur). A week after spraying, distinct chlorotic spots were visible on the lamina and midribs all over the sprayed area. The leaf material showing these discoloured spots where the liquid had accumulated into droplets and dried up, was preserved in Formalin-Acetic-Alcohol.

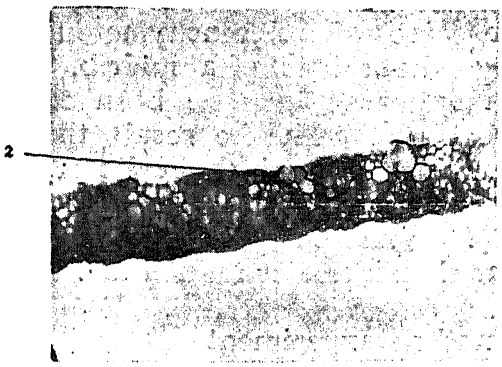

FIG. 1

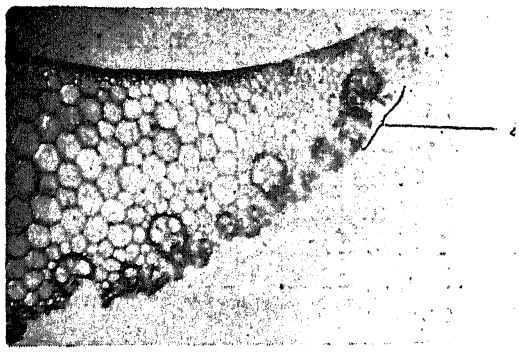

FIG. 2

FIG. 3

FIG. 1. T.S. of lamina showing disruption of epidermis which is intact at *a* (× 60)

FIG. 2. Part of T. S. of midrib showing extensive disintegration of tissues. Blackish substance is present in Xylem vessels and in parenchymatous cells at *b* (× 40).

FIG. 3. Part of T.S. of midrib showing the weakening of middle lamella as indicated by regular tearing away of cells at *c* (× 250).

Hand sections (Figs. 1 and 2) through these spots showed that liquid affected the plant tissues adversely, both in the lamina and the midribs. The lumen of long cells

of epidermis in the affected area was occupied by opaquely black substance insoluble in water, alcohol and xylol. The neighbouring cells containing chloroplasts were similarly affected, and in some cases xylem and phlœm were rendered functionless as they were choked by this substance. In the case of sclerenchymatous cells forming the ridges of a midrib, middle lamella appeared to have been considerably weakened with the result that they were unable to hold the cells together while the material was being sectioned (Fig. 3). Sometimes these cells of the vascular sheath also contained this blackish matter.

In another experiment carried out at Motihari (District Champaran) where stock solution of D.D.T. dissolved in a mixture of turpentine and toluene, was diluted to 0·2% and lower concentrations with water before use as a remedial measure against white fly, no such discoloured spots were visible on the leaves even after four weeks. The study of juice attributes showed that concentrations higher than 0·2% had adversely affected the sucrose content of cane. Further work is in progress.

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February 24, 1949.

NATURE OF BOND IN IONIC CRYSTALS

IT is usually assumed that the bonds in the crystals of alkali halides are 100% ionic. This view has been based on the alleged additive relationships existing in the internuclear distances, molar refraction, diamagnetism, binding energy, &c.

A detailed examination of the data on the above properties will however reveal the marked departure from the law of additivity.

In the present paper we have shown that the data on the crystal energy is completely in agreement with the partial ionic nature of the bonds in the crystals.

The energy of the crystal has been calculated by Born and co-workers by applying the equation $U = A\left\{\frac{e^2}{r}\left(1-\frac{1}{n}\right)\right\}$, where A is Medelung constant, r is the internuclear distance. The values of n, the repulsion coefficient, vary from 6 to 12.

It has been pointed out by the present authors (see previous note) that the energy of a bond A–B is the sum of ionic $i\frac{e^2}{r}$ and covalent $(1-i)\sqrt{D(A-A)\,D(B-B)}$ energy. The energy of the bond in the crystal should be given

$$U = A\left\{i\frac{e^2}{r} + (1-i)\sqrt{D(A-A)D(B-B)}\right\} \quad (1)$$

where U is the observed crystal energy, A is the Madelung constant.

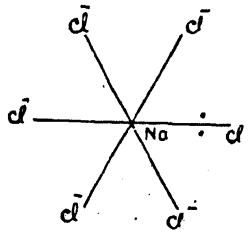
Following table gives the results for the ionic character calculated from crystal energies by using equation (1).

Bond	Crystal Energy	Distance		Ionic character	
		Crystal	Gas	Crystal	Gas
NaCl ..	180·4[P]	2·81[M]	2·51[M]	0·83	0·64
NaBr ..	171·7	2·98	2·64	0·86	0·64
NaI ..	160·8	3·23	2·90	0·86	0·45
KCl ..	164·4	3·14	2·79	0·85	0·74
KBr ..	157·8	3·29	2·94	0·86	0·70
KI ..	149·0	3·53	3·23	0·86	0·71
CsCl ..	153·2	3·56	3·06	0·91	..
CsBr ..	149·6	3·71	3·14	0·93	..
CsI ..	136·1	3·95	3·41	0·90	0·74

P—Pauling, *The Nature of the Chemical Bond.*
M—Maxwell and Mosley, *Phys. Rev.*, 1937, **52**, 968.

Discussion.—The ionic character in crystals is systematically higher than the gas values owing to increased internuclear distance r. A plot of i against r^2 shows that the ionic character is directly proportional to r^2, *i.e.*, dipole moment is proportional to r^3, *i.e.*, to polarisability.

The partial ionic character in the crystal can be explained quantitatively on the basis of covalent-ionic resonance in a unit $NaCl_6$. [*cf.* Pauling, *Nature of the Chemical Bond*, p. 72]. In the structure



in which a sodium atom is surrounded by six chlorine atoms, it will not form more