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# SELECTED ARTICLE

## Why Cattle Need Minerals.

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Work was started in 1935 at Coimbatore, under a scheme financed by the Imperial Council of Agricultural Research, to study the requirements of calves and cows for calcium and phosphorus. The experimental animals were fed with rations containing known amounts of the minerals, and the quantities excreted were determined; by subtracting the quantities excreted from the quantities fed the quantities retained in the body of the animals were determined. If more was consumed than excreted, the animals were considered to be getting sufficient for their needs, and if the quantity excreted was more than that consumed, the animals were considered as not getting sufficient for their needs. The requirements for a given mineral were estimated by the quantity required to be consumed to just balance the amount excreted.

**Chronic deficiencies.** As a result of this work it was found that a heifer calf from the time it was weaned up to the time it grew up and matured, required about 1 oz. of calcium and 1 oz. of phosphorus daily in its diet to supply its requirements for growth and bone building. When the heifer was pregnant and up to the time the calf was born the requirements for the minerals remained of much the same order; with the onset of lactation in the cow it was found that the requirement for phosphorus remained at about 1 oz. but the requirement for calcium depended on the quantity of milk given. A cow giving about 15 to 20 lb. of milk per day required 2 oz. of calcium per day and proportionately greater quantities for greater quantities of milk yielded. The requirement for calcium was appreciably higher in the cow in milk than when she was pregnant or when she was a young growing animal. The rations fed during the experimental period were liberal ones providing an ample supply of concentrates consisting of cotton seed, groundnut cake, rice bran, *dal* husk, and green *cholam* or maize fodder or guinea grass or green grass; in addition 1 oz. per day of mineral mixture consisting of bonemeal and shell lime was given. This ration was fed on a sliding scale according to the size of the animal. The ration was liberal and provided for sufficiency of all nutrients, i. e. proteins, carbohydrates and fats and mineral matter for calves and heifers, but with the cows in heavy milk it was not found to be possible to supply sufficient calcium for their requirements and the animals were always excreting more calcium than what they got in their food. The quantities of phosphorus were usually sufficient. It is plain that a heavy yielding cow is chronically in a state of deficiency for calcium, even with a liberal ration *plus* a mineral supplement.

**Valuable data at Coimbatore.** The experiments at Coimbatore have given data on (i) the requirements of calves, heifers and milking cows which have not been known till now, (ii) have shown that even with a liberal ration as fed on Government farms, unless the ration contains 1 oz. of mineral mixture, it does not supply sufficient mineral matter to meet the needs of calves and heifers, and (iii) that with the cows yielding 15 to 20 lb. of milk per day, the liberal ration fed with the mineral mixture was not able to supply sufficient calcium to supply their requirements.

No experiments were conducted with working bullocks but the results obtained at Dacca (Bengal) by I. B. Chatterjee have shown that bullocks on a

ration of paddy straw and linseed cake required about the same amount of calcium per day, i. e., 1 oz. and about a quarter of that quantity of phosphorus for their daily requirements.

**Analysis of pastures.** A study was also in progress regarding the mineral content of natural pastures in the Province by a pasture survey. Samples of grasses from all parts of the Province were obtained and analysed for their chemical composition with special reference to their mineral value. It was seen that while in the greater part of the Province, the grasses had a good content of both calcium and phosphorus, those of the Malabar district were poor in both the minerals, the northern part of Salem district had a low calcium content in its grasses, while in Kurnool and parts of the Anantapur districts the calcium content was good but the phosphorus content was very low. The east coast districts had natural pastures of high nutritive value, and also the Coimbatore district in the south. The area of deficient minerals was therefore the Malabar district, while the North Salem and Kurnool district and parts of Anantapur were areas of imbalance with a good calcium and low phosphorus content.

**Deficiency disease.** When these results were studied in connection with the condition of the cattle in the areas, it was seen that in the areas of deficiency, i. e., Malabar district, the cattle are generally short in stature and in poor condition, and that good cows when introduced there rapidly deteriorated in yield of milk and in general condition. This could be explained by the poverty of the pastures in both minerals. In the Kurnool district the cattle, though in general satisfactory condition, suffered in some talukas from a disease known locally as *Vayu-pollu* or *Vayu-noppulu* diagnosed as rheumatic arthritis, which results in the animals being crippled by swelling and pain in the limbs, and unable to do any work. This disease affects working bullocks mainly but a few cases occur among cows and fewer among buffaloes. This disease is associated with an imbalance between calcium and phosphorus in the natural pastures of the area; the calcium content is high while the phosphorus content is very low.

Blood studies were conducted at Coimbatore and it was seen that the blood also had an abnormal imbalance of the minerals in it.

The study of the disease was extended to the water supplies of the areas where it occurred in a severe form and results revealed the presence of an element, fluorine, in the well water. Fluorine affects the absorption of phosphorus into the animal body after digestion and its presence probably aggravates the effects of a poor supply of phosphorus in the food of cattle in the affected areas. Further studies are in progress to find methods for the prevention and cure of the disease along the lines of the use of a mineral mixture to supply sufficient phosphorus lacking in the food and to remove the fluorine in the water of wells in the affected villages by a simple method.

**Prevention and cure of deficiency.** The results of the Coimbatore experiments have shown not only the importance of the problem of mineral matter to cattle but also a way of overcoming deficiencies in its supply. In all experiments described above a mineral supplement was used to balance the supply of calcium and phosphorus to the animals, so that in addition to the calcium and phosphorus they consumed in the rations, additional quantities of the two minerals could be drawn upon from the mineral supplement fed to the animals. The mineral supplement consisted of equal parts of burnt shell lime and steamed bonemeal ground into a fine powder, mixed in equal proportions. Both shell lime and bonemeal are cheap and easily available in this Province. The burning of shell lime and steaming of bonemeal are comparatively simple processes, and as a result the mineral mixture can be had easily and cheaply. Such a mineral

mixture is available at about Rs. 6 per cwt. There are many other mineral supplements put up in various forms on the market, but those cannot compete in price with the mineral supplement used at Coimbatore.

By the use of the mineral supplement, animals which are suffering from a gross deficiency of the minerals of any one, or any imbalanced supply of either in relation to the other in their food are enabled to make good the deficiency or imbalance. For cows or calves which are generally undernourished as regards minerals or for animals living in a mineral-deficient area, the mineral supplement will make good the deficiencies and prevent the onset of symptoms of disease caused by the deficiency.

The table below gives approximate quantities to be fed to calves, cows, bullocks and breeding bulls. No information is available for sheep, goats and pigs and hence no recommendations have been made for these animals.

| Class of animals. | Quantity of mineral mixture per day. | Remarks. |
|---|---|---|
| Calves 0—18 months. | 1 oz. | |
| Heifers 18—24 months. | 1 oz. | Also when pregnant. |
| Cows in milk. | 2 oz. | If yielding above 20 lb. |
| Cows dry | 2 oz. | per day an extra ½ oz. per day. |
| Bullocks working | 1 oz | To be increased to 1½ oz. |
| Stud bulls. | 2 oz. | in animals above 1,500 lb. |

The mineral mixture should be fed mixed with the concentrate ration since it often has a smell which some animals do not relish, though they get used to it in course of time; if fed with concentrates the smell is not marked.

In the areas known to be deficient in the minerals, i. e., Malabar, Kurnool, North Salem and probably Tanjore districts, the quantities recommended above may be doubled to meet deficiencies of the minerals in the natural pastures.

The use of the mineral mixture should be constant. It is no use to feed it for a day or two and then to discontinue its use. Mineral mixture is cheap and in the quantities recommended will not cost more than one pie per day per animal. [*Indian Farming*, December, 1941.]

## ABSTRACTS

**The Growth of the Sugarcane Plant in India, Part I. Age-Fertilizer effects on the Physiology and Chemistry of Sugarcane.** B. N. Singh, *Proc. Indian Acad. Sci* B. 14: 201—234. The investigation deals with the effects of sulphate of ammonia (N), superphosphate (P), and sulphate of potash (K) applied singly or in combination at two levels each upon (i) height, tillering, leaf number, length and breadth of leaf, girth of stem, and nodes exposed; (ii) dry matter accumulation, photosynthetic and respiration rates, chlorophyll content and yield of stripped canes; and (iii) juice characters such as sucrose, glucose, Brix, purity, and extraction percentage of sugarcane *var.* Co. 312.

The canes were grown in standard size internally waxed pots in farm soil (sandy loam) and the records with respect to the characters mentioned above taken at successive stages of the life-cycle of the crop. The data are subjected to statistical analyses. The following conclusions are the outcome of these researches:—

(i) The nature of fertiliser effect varies both with respect to the age of the plant and the fertilisers used. In some cases such as assimilation, respiration