

PRETREATMENT OF COTTON SEED WITH AMMONIUM SULPHATE

PLACEMENT of fertilizers appears to be an important factor governing the response of a crop to fertilizer application.

In the case of cotton, the usual methods of applying Ammonium Sulphate at the time of sowing are (i) drilling the seed first and dropping the fertilizer by hand later in the opened out furrows and finally covering them up or (ii) drilling the fertilizer with dry seed itself.

A still more convenient method would appear to be to sow the cotton seed coated with Ammonium Sulphate. The coating with Ammonium Sulphate is best done when the seed in a slightly moist state, after treating it with earth and dung paste, is mixed up with dry Ammonium Sulphate. Maximum amount of Ammonium Sulphate that can be coated round the seed depends upon the variety having a big or small size seed and the seed rate used. In the case of V. 434 cotton seed it is estimated that Ammonium Sulphate equivalent to 20 lbs. of Nitrogen can be coated round it, the seed rate being 20 lbs. per acre. The number of seeds per gramme weight is 14.69 in the case of V. 434 cotton.

An experiment was conducted on the Seed and Demonstration Farm, Khandwa (Nimar), during 1941-42. Nitrogen applied was at the rate of 10 lbs. per acre, in the form of Ammonium Sulphate. Mean yield of kapas obtained was as shown in the table below. The

Mean yield in lbs.

Yield	Treatment				Mean	S.E.
	Coated	Topdressed	Half drilled with dry seed and half top-dressed	Control		
1	2	3	4	5	6	7
Per acre	644.0	443.2	456.8	387.2	482.8	31.72
Per cent. of mean	133.8	91.8	94.6	80.2	100.0	6.57
Per cent. of control	166.3	114.5	118.0	100.	—	—

experiment was of a randomised block type, with five replications, the plot size being 1/40th of an acre.

Important observations are:—

- (i) Application of fertilizer at the time of sowing appears to be better than applying it as a top dressing.
- (ii) The best way of applying the fertilizer at the time of sowing is to coat it round the seed before sowing. The increase in yield obtained by this method is over 66% above the control, the increase which is not usually obtained even by higher application of over 40 lbs. of nitrogen per acre in the usual manner. Coating with Ammonium Sulphate is best done when the seed, in a slightly moist state after treating it with earth and dung paste, is mixed up with dry Ammonium Sulphate.
- (iii) The treated plots are earlier to mature and have a better bearing and larger size of bolls; those in which the seed is coated are the earliest to mature.

The results will be discussed in full elsewhere. Further work is in progress.

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METALLOGRAPHY OF INDO-GREEK BRONZE COINS FROM TAXILA

THROUGH a chemical and metallographic analysis and *Diamond Hardness* of the Indo-Greek coins from Taxila, an attempt is being made to reconstruct the system of ancient Indian Coinage and to trace the sources of the metals employed. One of the interesting minor results of these investigations confirms and is confirmed by Prof. Birbal Sahni's conclusions regarding the minting of ancient Indian coins at Rohtak.

In 1936 Prof. Birbal Sahni, F.R.S., discovered a number of coin moulds used by the Yaudheyas¹ (Ca. 100 B.C.) in certain mounds at Kokra Kot in the immediate vicinity of Rohtak (Long.

76° 35' E, Lat. 28° 54' N) in the Punjab. This discovery enabled him to reconstruct the technique employed by the Yaudheya mint masters. It is not unlikely that the same technique has been employed in other ancient mints as well.

is a system of polygonal grain boundaries representing crystal grains which constitute the mass of the metal, one finds large grains in the coins of the central moulds. The coins in the top and bottom layers of moulds show



FIG. 1

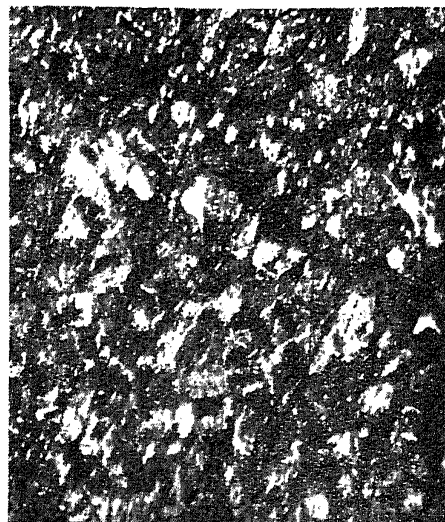


FIG. 2

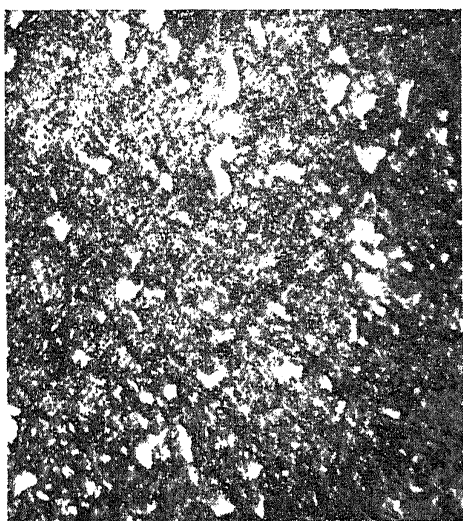


FIG. 3

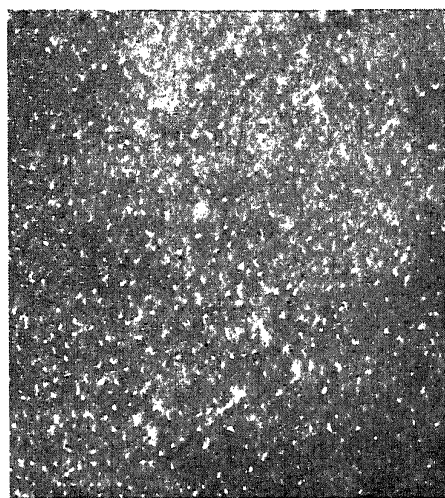


FIG. 4

Figs. 1-4. Etched with acid Ferric chloride. $\times 100$.

Molten alloy is poured into the complex mould system reconstructed by Prof. Sahni in which the moulds are arranged one over the other. If the alloy is allowed to cool of itself through the critical temperature, the central moulds in the system are kept hot by the molten or hot alloy in the top and bottom tiers of moulds. Thus the central moulds cool slowly. On the other hand, the moulds at the bottom and at the top cool more rapidly. Hence the coins in the different layers of moulds must show variations in the metallographic structures. Remembering that the cooled alloy

grains which are structureless and almost amorphous through rapid cooling. In the latter case the molten metal has had no time to crystallise. Between these two extreme limits, there are structures showing different grain sizes and of grains in the making.

The mechanism of minting reconstructed by Prof. Sahni was verified in the case of Indo-Greek bronze coins² (Ca 250 B.C.-60 A.D.) from Taxila (Long. 72° 50', Lat. 33° 40')—a region not far away from Rhotak. Microphotographs of about 120 coins were taken. The metallographic structures of these coins grouped

themselves under four broad divisions which are illustrated below. Fig. 1 shows large crystals and represents the metallographic structure induced by a slow cooling of the alloy. Fig. 2 shows the structures of a more rapid cooling alloy. The crystals are smaller in size. Further growth has been suppressed as a result of quick cooling. The coins were probably from moulds between the central and the top or bottom tiers of moulds. Fig. 3 shows the structure when the rate of cooling is higher than that for (1) and (2), probably of coins in moulds nearer the top or the bottom tiers than the central ones. There are only a few small crystals in a groundmass of amorphous precipitations. Fig. 4 shows the structure when the cooling is still more rapid, such as of moulds at the top or bottom of the system and consists entirely of precipitation.

Thus the metallographic structures broadly fit in with the reconstruction suggested by Prof. Sahni. These metallographic structures can be explained somewhat differently—at least so far as the Indo-Greek coins are concerned. If the mould containing the molten alloy is covered with earth or such other non-conducting material or if some process of annealing is employed, the rate of cooling will be slow, resulting in large grain size such as is illustrated in Fig. 1. The coins being very thin (2-3 m.m. in thickness), the slow cooling should have been purposely effected. Otherwise the appearance of large grains is inexplicable. On the other hand, if the molten metal is suddenly dipped into a liquid or normalised, the structure shows minute precipitation as in Fig. 4 without any crystalline structure. Between these extreme limits, Figs. 2 and 3 illustrate the structures when the molten metal neither cools so slowly as in (1) nor so rapidly as in (4). Probably air cooling or cooling with a wet mould was employed in such cases.

It is interesting to note that the crystals do not show any twinning or elongation. The absence of such deformation is another clear indication that the Indo-Greek coins have not

been die-stamped as modern coins are, but cast in moulds.

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April 8, 1942.

¹ B. Sahni, *Current Science*, 1935-36, 4, 796.

² The author is indebted to Rao Bahadur K. N. Dikshit, Director-General of Archæology in India for these coins.

ON THE OCCURRENCE OF PARGASITE IN MYSORE

LAST year was published in the *Mysore University Journal*¹ a comprehensive account of the optical characters of some "Blue amphiboles" in the Mysore State; and from such optical characters, it was deduced that their chemical composition could be expressed as a mixture of the Pargasite, Common Hornblende and Glaucophane molecules. It was also deduced that an increase of Soda and Ferric content, denoted intenser pleochroism and higher birefringence.

One of these Blue amphiboles, collected among the Ultrabasic rocks of the Mysore District, has been kindly analysed by Mr. M. Sessa Iyengar, and his colleagues, Mr. G. Narayan and Dr. M. R. Aswathanarayana Rao. For comparison are set below analyses of Pargasite and Hornblende.²

	Blue Amphibole	Pargasite	Hornblende
SiO ₂ ..	46.89	41.26	39.80
Al ₂ O ₃ ..	11.86	11.92	14.28
FeO ..	12.08	9.92	19.02
Fe ₂ O ₃ ..	1.96	4.83	2.56
CaO ..	10.81	11.95	10.73
MgO ..	11.91	13.49	9.10
Na ₂ O ..	3.05	1.44	1.79
K ₂ O ..	0.15	2.70	2.85
H ₂ O ..	0.70	0.52	1.42