The metric (2.1) will define a static gravitational field within that region of the 3-space II in which $1 - a^2 + m/\rho > o$, *i.e.*, in which $\rho > \rho_0$. This region depends on the sign of the parameter m. Figures 1 and 2 indicate the portion of the (R, ξ) plane (the meridian plane) which generate the regions of validity by rotation round the ξ-axis in the 3-space II, corresponding to the cases $m > o$ and $m < o$.

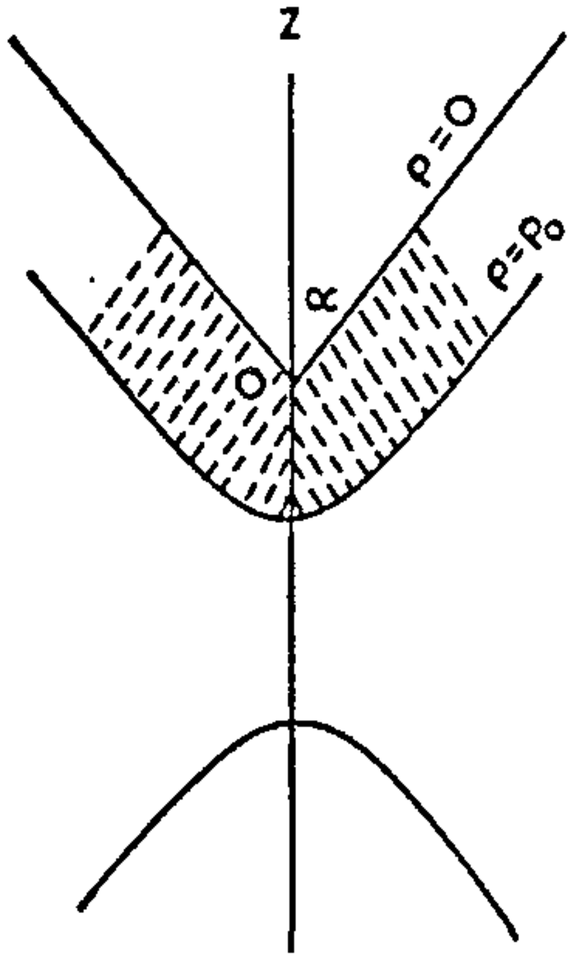

FIG. 1 m > 0

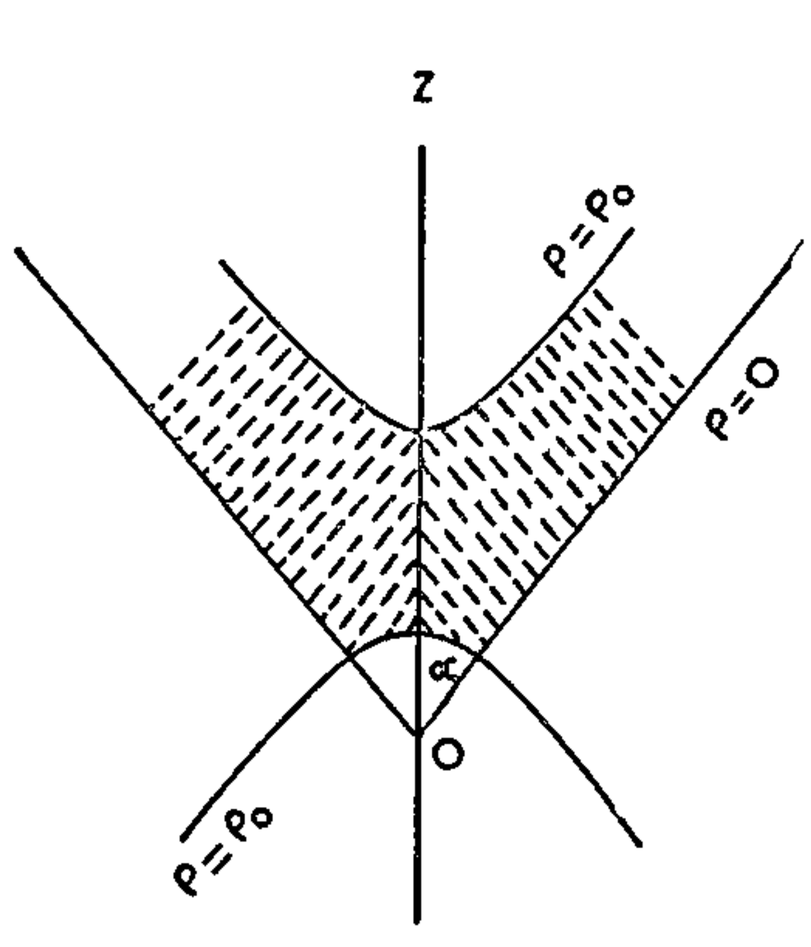

FIG. 2 m<0

FIGS. 1-2. The region of validity is obtained by rotating the shaded portion about OZ.

It will be seen from the figures that in both cases the 'black holes' are open and spatial infinity is included in black holes. For the case $m < o$, the black regions are separated and the singularity $r = o$ is enclosed in a black hole.

One can write down the equations of geodesics within the region of validity. It is found that a material test particle placed at rest at any point will experience a radial repulsion away from the origin O ($r = o$) and will have $d\theta/ds = o$, $d\phi/ds = o$ all along its path and so will move away from the origin in the radial direction. Thus the gravitational pull between a Tachyon and a material particle is a repulsive force. It appears therefore that assuming the existence of Tachyons implies assuming the existence of particles which repel material particles under gravity.

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SURVEY FOR A HIGH METHIONINE VARIETY IN THE WORLD COLLECTION OF CHICKPEA

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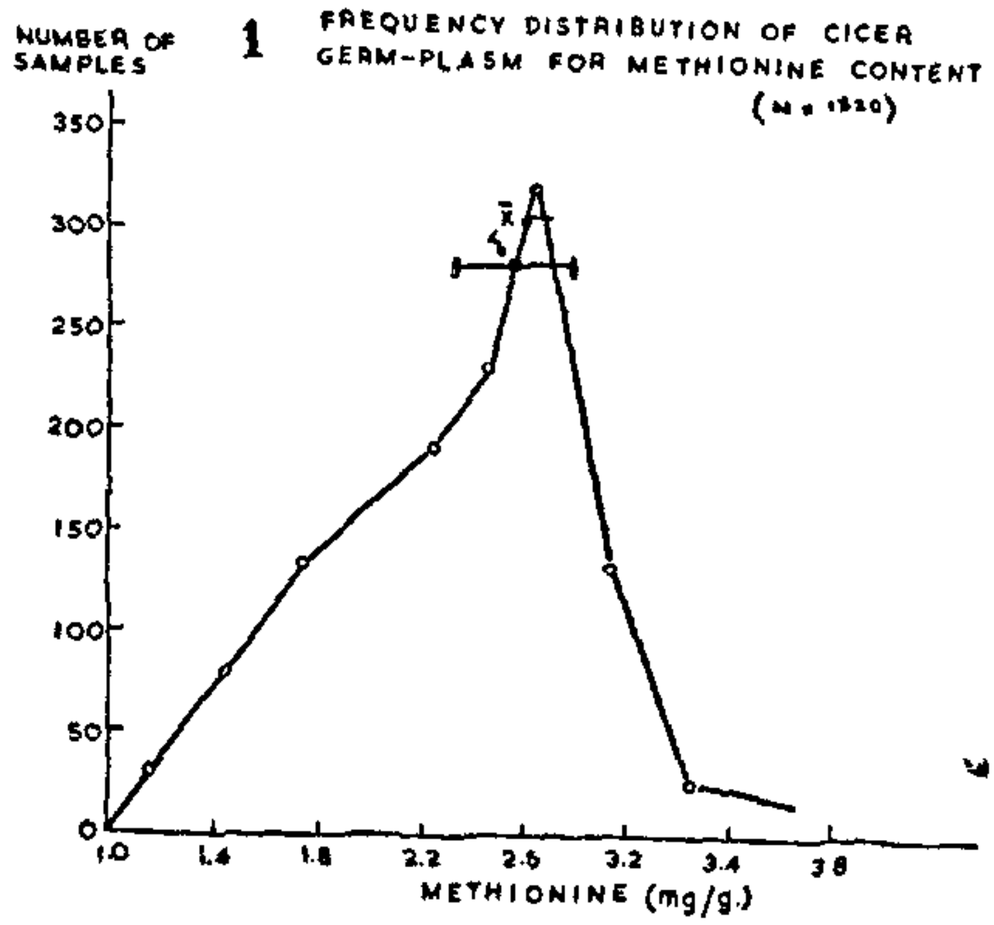
RESEARCH towards quantitative and qualitative improvement of pulse crops is essential because of the vital role that these crops play in providing a reasonably balanced protein component in the diets of primarily cereal eating people Though, in comparison to cereals, pulses have a higher protein and lysine content, they lack in the sulphur containing essential amino-acids, methionine and cystine, which results in their reduced net protein utilization (NPU).

Indian Agricultural Research Institute maintains the germplasm stock of various pulses in which more than 6,000 cultivated and non-cultivated strains of chickpea are available[1]. The same are being rapidly screened for the crude protein content and methionine content. Already, out of some 1,300 strains screened so far, four high methionine genotypes have been isolated. The results of the survey concluded so far are given.

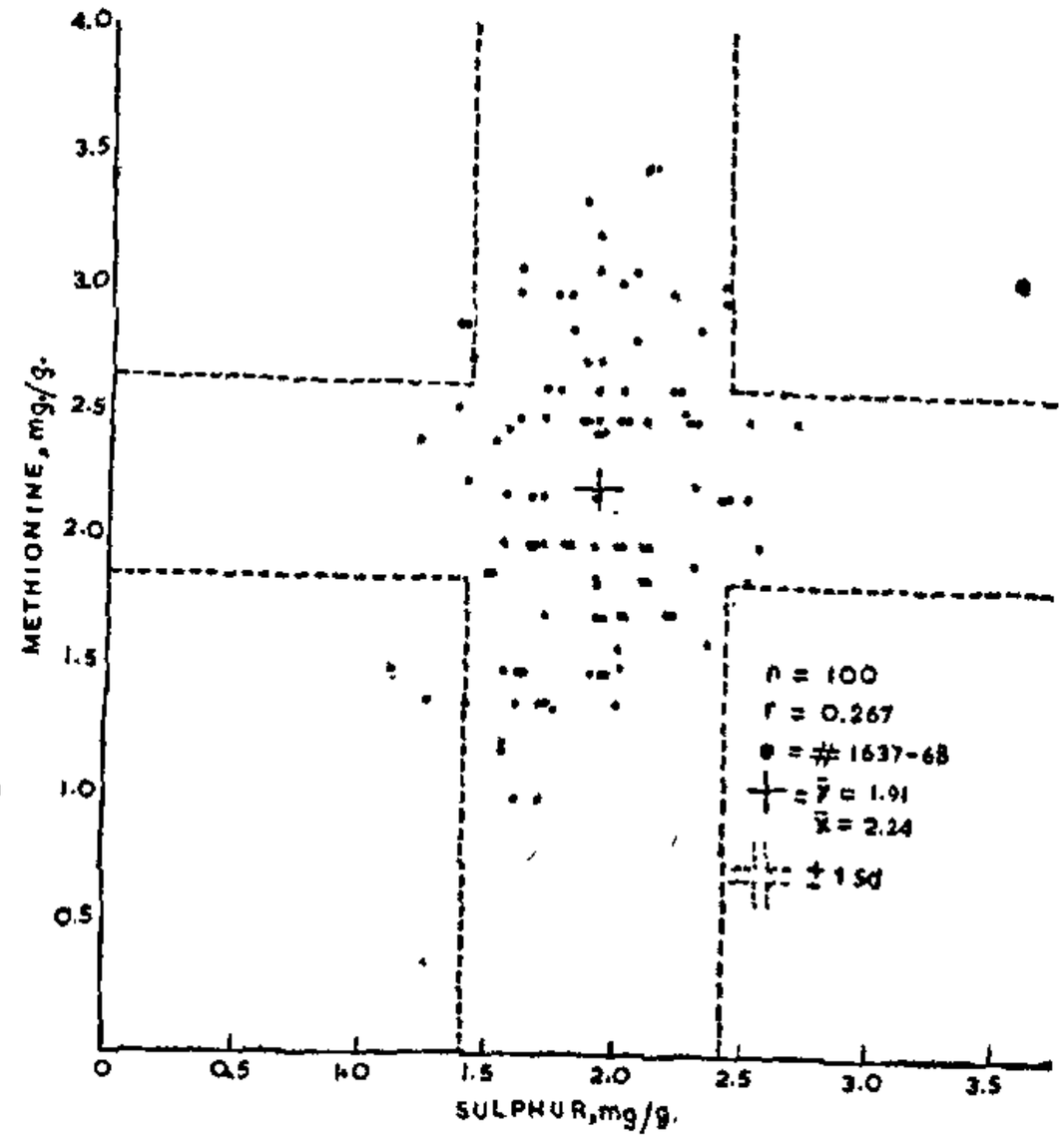
The samples in the world collection of gram represent cultivated and non-cultivated strains collected from twenty-one countries. For the analysis, random samples were taken from the crop raised under uniform conditions in 1968–69. The samples were milled in a hammer mill to give a particle size of 400 ± 100 microns.

The protein content was determined by Auto analyser–colorimetric technique[2]. Total sulphur was determined by the turbidimetric method of Chesnin and Yein (1951)[3] which was slightly modified by replacing ashing with the nitric-perchloric digestion[4].

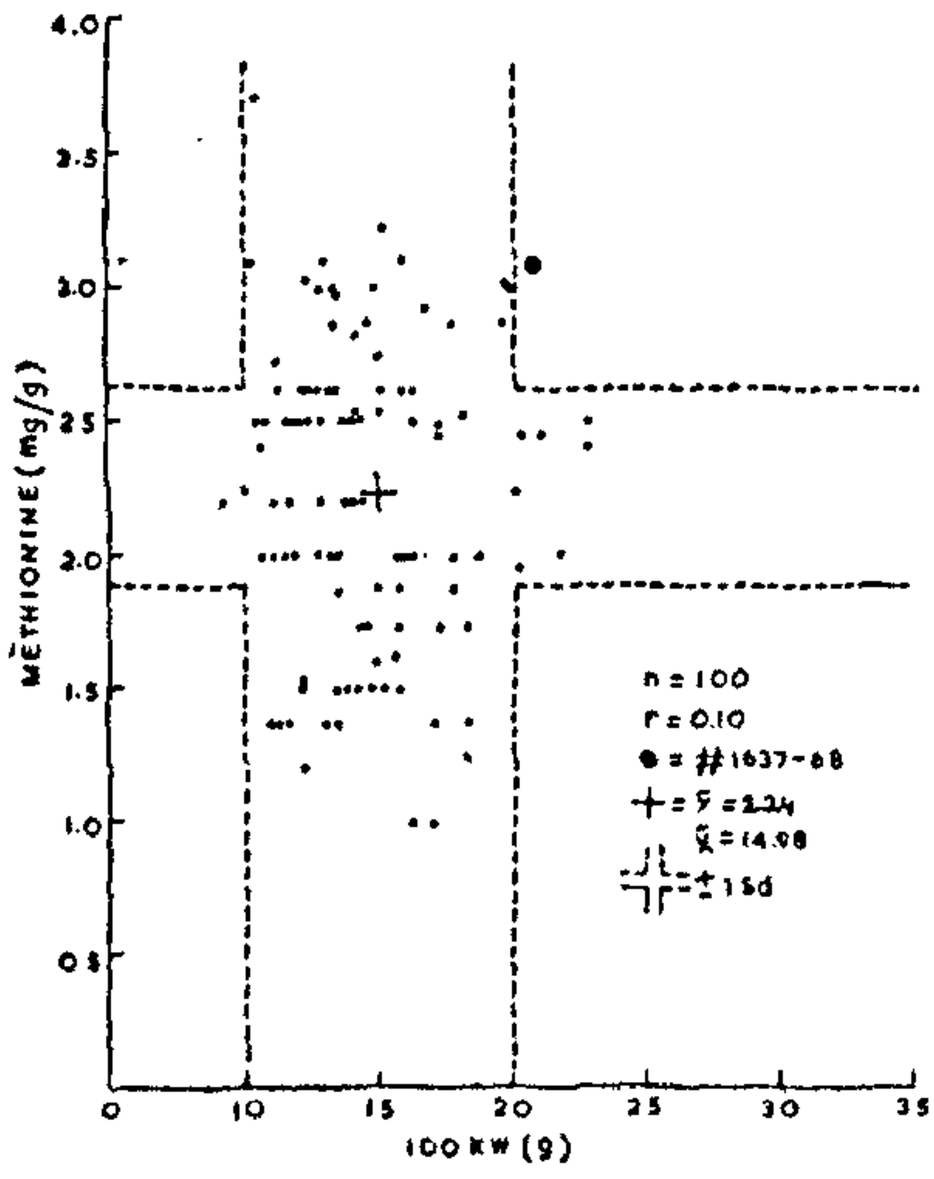
1 FREQUENCY DISTRIBUTION OF CICER GERM-PLASM FOR METHIONINE CONTENT (N = 1520)



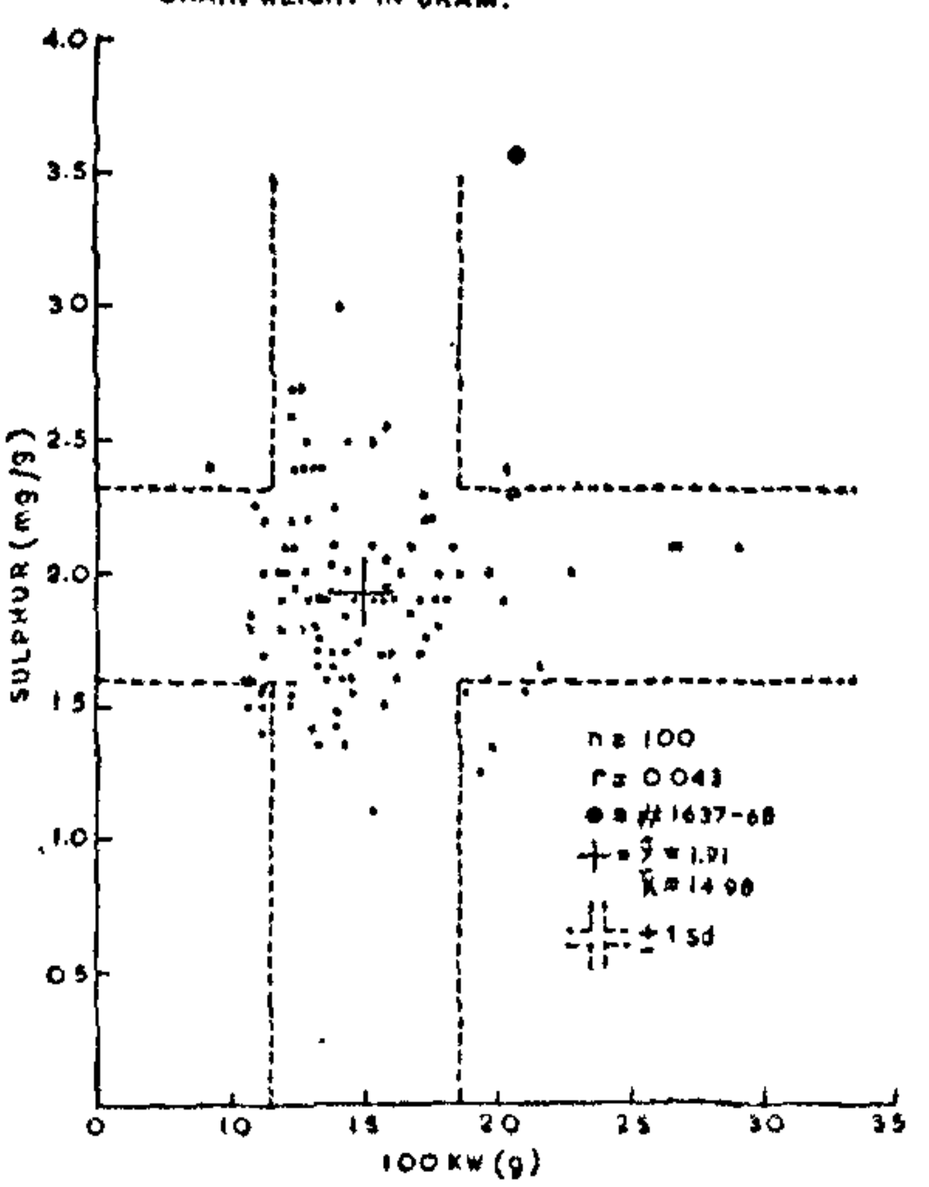
2 SCATTER DIAGRAM SHOWING RELATIONSHIP BETWEEN METHIONINE AND SULPHUR CONTENT IN GRAM.



3 SCATTER DIAGRAM SHOWING RELATIONSHIP BETWEEN METHIONINE CONTENT AND GRAIN WEIGHT IN GRAM



4 SCATTER DIAGRAM SHOWING RELATIONSHIP BETWEEN SULPHUR CONTENT AND GRAIN WEIGHT IN GRAM.



FIGS. 1-4

Methionine was determined colorimetrically using McCarthy and Sullivan's technique[5] as modified by McCarthy and Paille[6]. The extraction was done after Das and Gupta[7].

The frequency distribution of the samples analysed is depicted in Fig. 1. While the values ranged from 1 to 3·55 mg methionine/g sample, the mean of the 1,320 samples was 2·24 + 0·4 mg/g. As against our earlier report, this detailed study, and the data from other crops, have now revealed that the degree and nature of correlation between sulphur and methionine content vary from crop to crop. In this study, 100 samples out of 1,320 were selected to represent the whole range of methionine content and their sulphur was determined. The mean sulphur content of these samples was 1·91 ± 0·36 mg/g and the mean methionine content was 2·24 ± 0·50 mg/g. As evident from Fig. 2, very low and insignificant correlation ($r = +0·267$) was obtained. This implies that the crude sulphur content cannot be utilized to predict the methionine content in gram. However, it should be mentioned here that in the absence of a suitable technique for rapid estimation of cystine, it is advisable to estimate the total sulphur content, since methionine gets utilized in place of cystine even if the former is already in short supply in the diet.

A nutritionally superior genotype in any crop plant will be acceptable for cultivation only when it accompanies higher yielding potential as well. In gram, out of the two components of yield, namely, number of grains per plant and the seed weight, the latter parameter is of considerable value in selection with reference to the nutritional quality. It is so because when an amino-acid is expressed on the flour basis rather than on the protein basis, it directly reflects the yield of that amino-acid per unit area. In this study, the grain weight (100 kernel weight) was determined for all the samples. Considerable variation for grain weight was noted. In 100-selected samples the grain weight ranged from 9·16 to 29·11 g/100 kernels, with a mean of 14·98 ± 3·5 g/100 grains. Figures 3 and 4 show that no significant correlation exists between sulphur ($r = 0·10$) and methionine content ($r = 0·04$) with the 100 KW. However, one of the strains (1637–68) seems to be highly promising since it has very bold grains (100 KW = 20·60 g) and at the same time happens to be having very high methionine (3·10 g/100 g flour) and sulphur content (3·6 g/100 g flour). This strain (shown as a big dot in the figures) was analysed for the total amino-acid (Table I).

TABLE I

Amino-acid composition of = 1637–68 (NP-49) strains of chickpea

Amino-acid		Gram amino-acid/16 g nitrogen
Aspartic acid	..	11·64
Threonine	..	3·67
Serine	..	4·60
Glutamic acid	..	17·18
Proline	..	3·99
Glycine	..	3·86
Alanine	..	4·20
Valine	..	4·65
Isoleucine	..	4·38
Leucine	..	7·44
Tyrosine	..	3·19
Phenylalanine	..	5·61
Lysine	..	7·26
Histidine	..	2·61
Ammonia	..	1·11
Arginine	..	9·80
Methionine	..	1·72
Cystine	..	1·74
Tryptophan	..	1·12
Protein content	..	21·5%

The results are expressed as gm amino-acid/16 g N or 100 g protein. The value obtained colorimetrically (3·10 mg/100 g flour) for the methionine content was not significantly different from that obtained by the auto-chromatographic technique (3·68 mg/100 g flour). This genotype should prove of great value in the breeding programmes aimed at producing a bold seeded, high methionine variety of chickpea.

The authors are indebted to the Indian National Science Academy for the financial assistance and Prof. B. Eggum of Landokonomisk Forsoqslaboratorium, Kobenhavn, Denmark, for the amino-acid analysis.

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