

for permission to report the cases and to Dr. N. G. Bhattacharjee, Senior House Physician to the Additional Physician, Medical College Hospitals, for the clinical notes.

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ARGEMONE AND MUSTARD SEEDS

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THERE is at present considerable agitation in the country over the adulteration of mustard oil with argemone oil. It has been fully realized that ingestion of mustard oil contaminated with argemone oil produces symptoms similar to those of epidemic dropsy. The experiments carried out in the field and the observations made by the various workers in this respect support the argemone contamination theory in the causation of epidemic dropsy. A few of these names may be mentioned, e.g. Lal, Chopra, Chaudhuri, Sarkar, etc. The credit for the idea underlying this theory should however be given to Dr. Sarasi Lal Sarkar (1926). At that time there were two divergent views which held the field: one was that the disease was due to contaminated rice and the other to deficiency in diet.

It is true that the disease has been noticed mostly among the rice-eating population but it has not been possible to produce the disease by feeding on contaminated rice. As some of the symptoms in epidemic dropsy are similar to those noticed in beri-beri, the two diseases were at one time thought to be of common origin. Detailed investigations subsequently led to the conclusion that the two were different and that the aetiological backgrounds were also different.

While it has been held that the toxic principles of argemone seeds gain entrance into the system through the alimentary canal, there are undoubtedly a certain number of cases of epidemic dropsy where no mustard oil has been taken with food. The writer came across a few

such cases at Banaras at the time when the great epidemic swept practically over the whole of Bengal during 1934 to 1939. At Banaras, eye symptoms, especially glaucoma, were a particular feature of the disease. The fact that patients who are not in the habit of taking mustard oil yet suffer has been explained to be due to contaminated mustard oil being used for anointing the body before bathing.

Epidemic dropsy has assumed a serious public health problem at least in certain parts of India where mustard oil is consumed. It has been taken for granted that the contamination of mustard oil with argemone oil is merely accidental as it is widely believed that both mustard and argemone often grow in the same field and at the same time and that the harvesting of both is done also simultaneously. The farmer is said not to pay much attention to the separation of one from the other at the time of harvesting as it is believed that argemone seeds are oil-producing and at the same time harmless.

To a common observer both argemone and mustard seeds look almost alike and unless critically examined the difference is difficult to detect. As the argemone seeds are of dark colour, they get mixed up with the black mustard. Sometimes white mustard is also mixed with black mustard in which there may be a small fraction of argemone seeds. The contamination is seldom found in a high proportion and the presence of a few argemone seeds in a sample of mustard strengthens the view in favour of accidental mixture.

If it is remembered that an argemone seed on account of its hard testa will burst with a report when pressed with the nail of the thumb, while a mustard seed, being much softer, will burst easily without any appreciable sound, the detection of the difference will be easy.

The author in order to determine whether the presence of argemone in mustard is accidental or deliberate made extensive investigations in the field and came to the conclusion that the presence of even 'a few' grains of argemone must be regarded as deliberate. When we take into consideration the relative oil-producing properties of the two, we find that argemone seeds will yield a higher proportion of oil than mustard. Generally speaking mustard seeds will yield 30 to 33 per cent of oil whereas argemone will yield as much as 36 per cent. There is a gulf of difference between the prices of the two seeds: while mustard seeds are sold at Rs. 36 per maund, argemone seeds are obtainable at Rs. 5 and therefore a mixed oil will be cheaper than pure mustard oil.

The argemone grows wild especially in barren fields and waste lands. It is never cultivated and there is no harvesting in the sense used for other field produce. Mustard is sown after the rains in October and is harvested before spring

from January to February. Argemone capsules on the other hand will not mature before late summer, *i.e.* May. A few argemone plants may occasionally grow along with mustard in the same field. The former are as a rule cut down and on account of the thorny nature of the plants, they are never collected with the mustard but are thrown away at the time the harvesting of mustard is done.

The argemone plant is different in every respect from the mustard plant. Although the sprouting of the former takes place in the cold season, yet the flowers do not appear before February. The capsules appear from March onwards and the seeds lie within the capsule. The latter, when dry, burst at the top but the seeds do not escape until the capsules, which yet remain attached to the plant, point downwards. The seeds are ultimately scattered on the ground. There is never any real showing of argemone. On account of the thorny nature of the plant, including its leaves and capsules, it is difficult to handle either the whole or any part of the plant. For the collection of the seeds, a small basket is held underneath the dried plants which are beaten by means of a stick. The capsules are hit and the seeds which lie loose in the capsule fall into the basket.

The capsule of *Argemone mexicana* is about 1 to 1½ inches long, more or less oval in shape, intensely prickly and opens by valves at the apex.

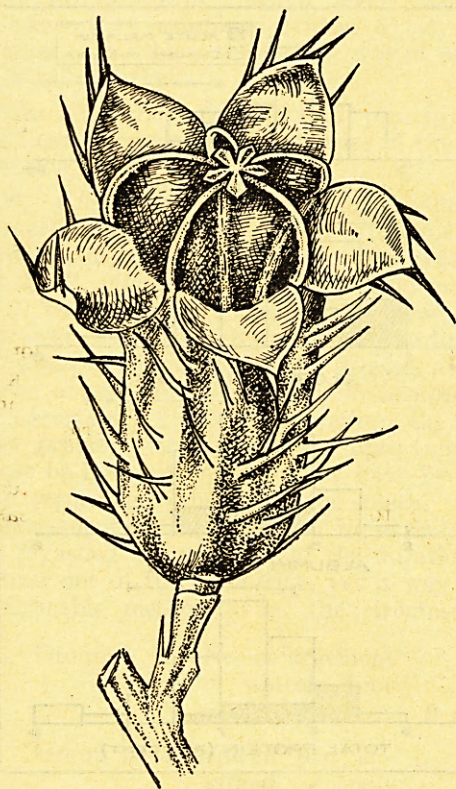


Fig. 3.

Figures 1, 2 and 5 (plate L) and figures 3 and 4 (*a* and *b*) below will show the character of the plants, capsules and seeds of argemone plants and also of mustard seed.

In the countryside it is not unusual to find waste fields in which there are heavy growths of argemone plants. This creates the impression that the plant has been purposely cultivated for its seeds. This is an erroneous idea. The fields are waste lands and the seeds which drop to the ground lie dormant till the next sprouting season. In this way heavy growths of argemone plants in a field take place.

Figures 6 to 8 (plate L) show various argemone fields.

The moot point therefore is to determine whether the occasional presence of a few grains of argemone with mustard should be regarded as wilful or accidental adulteration. Taking all things into consideration, particularly the time of ripening of argemone seeds, which takes place in late summer when mustard has already been collected and stored away, its good yield of oil, its rediculously low price in comparison to the price of mustard and its easy availability, the general opinion would be in favour of wilful adulteration.

The commercial people hold that the presence of argemone seeds in mustard is not adulteration but is merely accidental and in support of the latter contention it is argued that otherwise a much higher percentage of argemone would be found. However, recently cases have been brought to light in the Punjab where fatal consequences have resulted after taking mustard oil very highly adulterated with argemone oil, death having taken place within two to three days. In the ordinary course it is generally a slow poison due to the cumulative effects of the toxic principles of argemone.

There is now a tendency on the part of the health authorities to devise means to neutralize the toxic effects of argemone. Studies are being carried out in this line in different places

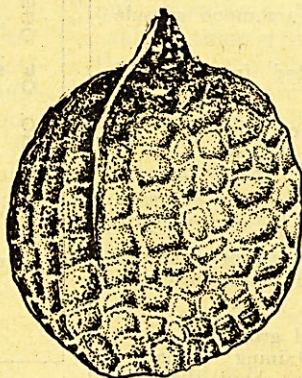


Fig. 4a.

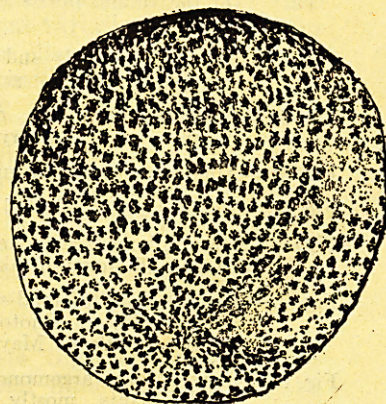


Fig. 4b.

in India. While it is no doubt easy to detoxicate a contaminated sample of mustard oil, it is difficult to retain all its essential properties which are valued so highly for being used for cooking purpose.

The writer is convinced that argemone is used as an adulterant of mustard, its presence in a sample of mustard does not indicate an accidental event, and that the presence of an appreciable amount of argemone in mustard oil must be regarded as wilful and should be stopped by law. The detoxication should not be enough: the oil should be made unfit for human consumption by denaturing (like methylated spirit) and used up for some other purpose (illumination, soap-making, lubrication, etc.).

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EXPLANATION OF FIGURES

Fig. 1.—*Argemone mexicana* Linn. showing immature capsules. The leaf, stem and the capsule are spinous. The plant was collected in May 1950.

Fig. 2.—Shows well-grown plants of *A. mexicana* Linn. with immature capsules and still in the flowering stage. All parts of the plant except the petals of flowers are spinous. Prominent veins are seen in the back of the leaf which are spinous. This plant was collected in the first week of May.

Fig. 3.—Shows a mature capsule of *Argemone mexicana* Linn. which has opened at the top.

Fig. 4a.—Shows a magnified view of an argemone seed. The seed is nearly spherical, bears a stalk attached to the upper end; the surface is rough with ridges and depressions. The testa is hard and brittle, when pressed with the nail of the thumb bursts with a report.

Fig. 4b.—Shows a magnified view of a mustard seed. The seed is nearly spherical, the surface appears smooth but when seen under magnification fine ridges are seen on the outer surface; it is soft and when pressed with nail of the thumb bursts without any appreciable sound.

Fig. 5.—The mustard pods and the argemone capsule are placed side by side.

Fig. 5a.—Mustard pods were collected from Bengal in the end of January.

Fig. 5b.—Almost matured argemone capsules.

Fig. 5c.—Mustard pods collected from U.P.

Fig. 6.—Shows a large argemone field in the flowering stage. Photograph taken in the end of April.

Fig. 7.—Shows a group of road-side plants of argemone still in flower. Photograph taken in Orissa in the middle of May.

Fig. 8.—Shows a large argemone field grown on waste land. Plants mostly containing immature capsules. Photograph taken about the end of May.

STUDIES ON PLASMA PROTEIN

III. MALARIA

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Two distinct groups of cases were encountered during the study of plasma proteins in malarial patients. One was acute malaria, which showed all the features of an acute febrile infection. The other was chronic relapsing malaria, some cases were inadequately treated, and many had: hepatomegaly and splenomegaly.

Plasma proteins of 40 patients, admitted in the hospital, were studied and in all of them malaria parasite was found in the peripheral blood. Out of these cases 9 had acute malaria, who gave no history of malarial infection at least in the recent past. Plasma proteins were determined within 7 days of the onset of the disease, during febrile period without any relation to the rigor and before any treatment was given. In the other group of 31 patients, the history of the disease was quite different. They were admitted in the hospital for fever but the attacks were neither primary nor acute. They had been suffering from malarial fever for a varying period, extending over years in some cases.

Distributions of plasma proteins and their fractions are graphically represented in figure 1.

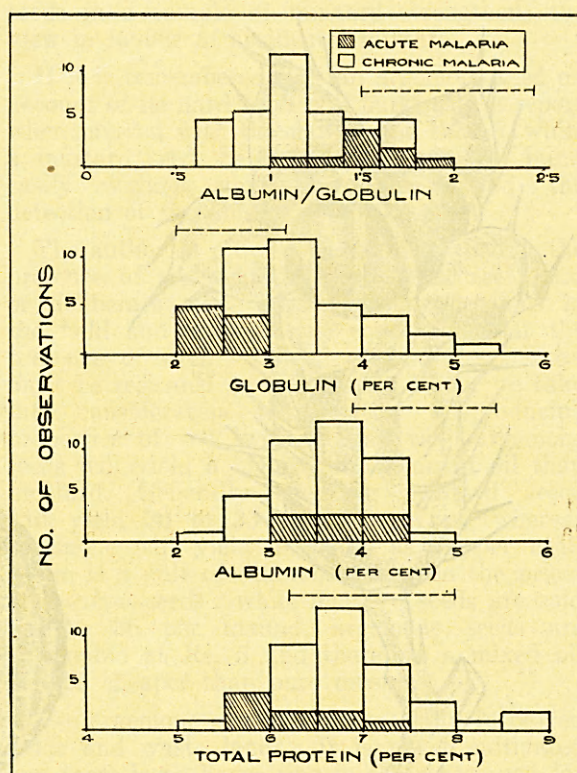


Fig. 1.



Fig. 1.



Fig. 5a.

Fig. 5b.

Fig. 5c.



Fig. 6.



Fig. 7.



Fig. 2.



Fig. 8.