Remains of a Purple Dye Industry Found at Tel Shiqmona*

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THE PURPLE dye was produced from the hypobranchial gland of several species of marine snails of the family Muricidae (Pl. 27:B). In order to extract the dye, the dyer had to break open the shell and remove the tiny gland which contained the raw material for the dye. According to the description given by Pliny,[1] the upper parts of the large snails were broken (Pl. 27:C) but the small ones were crushed. These broken and crushed muricid shells are usually the only evidence for the existence of a purple dye industry at a given site. Only at a few sites have actual installations been found, or remains of the vessels in which the dye was prepared, with residues of colour. These include: Minet el-Beida, the harbour quarter of Ugarit, where a sherd with traces of dye has been dated to the fifteenth-thirteenth centuries B.C.E;[2] Sarepta, Sounding X (thirteenth century B.C.E.);[3] Tel 'Akko (thirteenth century B.C.E.);[4] and Tel Keisan (eleventh century B.C.E.).[5] An interesting installation was found at Tel Dor with traces of purple dye in a channel and a pit.[6] Two dyeing installations dating from the Hellenistic period were found at Delos, in Greece,[7] and at Tel Mor.[8] Pliny mentions that lead vats were used in the Roman period,[9] yet these archaeological finds have confirmed that pottery vessels were used earlier.

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* The material in this article is part of the findings included in an M.A. thesis submitted by the first author to the Department of Maritime Civilizations, University of Haifa. We would like to thank Dr. J. Elgavish, the excavator of Tel Shiqmona, for enabling us to inspect the material.

1 Pliny: *Natural History*, IX, 60, 126 (Loeb edition, pp. 247-249).

2 C.F.A. Schaeffer: Une industrie d'Ugarit — la pourpre, *Annales Archéologiques de Syrie* 1 (1951), pp. 188-192.

3 J.B. Pritchard: *Recovering Sarepta — A Phoenician City*, Princeton, 1978, pp. 126-127; idem, *Sarepta, A Preliminary Report on the Iron Age*, Philadelphia, 1975, pp. 71-84; P.E. McGovern and R.H. Michel: Royal Purple and the Pre-Phoenician Dye Industry of Lebanon, *Masca Journal* 3 (1984), pp. 67-68.

4 M. Dothan, personal communication.

5 J. Briend *et al.*: *Tel Keisan (1971-6): une cité phénicièn*ne *en Galilée*, Paris, 1980, pp. 226-227.

6 E. Stern and I. Sharon: Tel Dor, 1986 — Preliminary Report, *IEJ* 37 (1987), p. 208.

7 P. Bruneau: Document sur l'industrie délienne de la pourpre, *Bulletin de Correspondance Héllenique* 93 (1969), pp. 759-791.

8 M. Dothan: Tel Mor, *EAEHL*, III, pp. 889-890.

9 Pliny (above, n. 1), IX, 62, 133 (Loeb edition, pp. 252-253).

The remains of the purple dye industry from Tel Shiqmona can be divided into three categories: (a) The accumulation of dye-producing shells found to the south of the tell; (b) shells from various strata of the tell; (c) sherds with remains of purple dye from the tell.

(a) *The shells south of the tell.* An accumulation of shells of the three common species of dye-producing snails (*Murex brandaris*, *Trunculariopsis trunculus*, *Thais haemastoma*) was found about half a kilometre south of the tell. Approximately half of the shells were broken in the manner typical of dye extraction (Pl. 27:D). No sherds were found with the shells and there is no way by which they can be dated. The fact that only muricid shells were found in this accumulation, with no animal or fish bones or other edible molluscs, indicates that these remains are from an industry and not merely kitchen refuse.[10]

(b) *Shells from the tell.* Muricid shells were found in various strata of the tell, but not in any considerable concentration, nor were they related to any kind of installation.

(c) *The sherds with the residue of purple dye.* A relatively large number of sherds with traces of purple dye were found at Shiqmona. The colour was identified as genuine purple (6'6' dibromo indigo).[11] These sherds were found in various loci, dated by the excavator to the Iron Age II. The context in which the sherds with the colour residue were found points to industrial activity: remains such as charcoal, grinding stones, stoves, knives, spatulae, storage jars, net weights and sherds of large heavy vessels appear in greater quantities than in other loci.

The vessels (upper parts and body sherds) in which traces of colour were found have thick, heavy rims and thick walls (Fig. 1). The opening is 40-60 cm. wide. The lower part of a vessel, with a round, hollowed-out base, was also found in the same area.

Of special interest are the remains of the upper part of a large vessel displaying traces of purple dye on the inside (Fig. 1). This find is very important, not only because of the genuine purple dye thus preserved, but also because of the special way it had been deposited on the inner wall of the vessel: the only trace of colour was found in a clear stripe on the upper part of the inner wall, with traces of drops of colour running from the opening downwards. No other traces of colour were found in the vessel.

The fact that in both the vessel at Tel Keisan[12] and the one from Shiqmona the dye appears in the same pattern provides a clue as to one of the methods used for the preparation of the colour. These two examples show that the colour was used

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[10] Muricid snails were a source of food in the past, as they still are today in various coastal areas.

[11] The colour was identified by S. Edelstein and D.H. Abrahams of the Dexter Chemical Corp. USA, using infra-red spectographic tests. For details of the method see S.M. Edelstein and D.H. Abrahams: A New Method for the Analysis of Ancient Textiles, *American Dyestuff Report* 53(1) (1964), pp. 19-25.

[12] J. Briend *et al.* (above, n. 5), pp. 226-227.

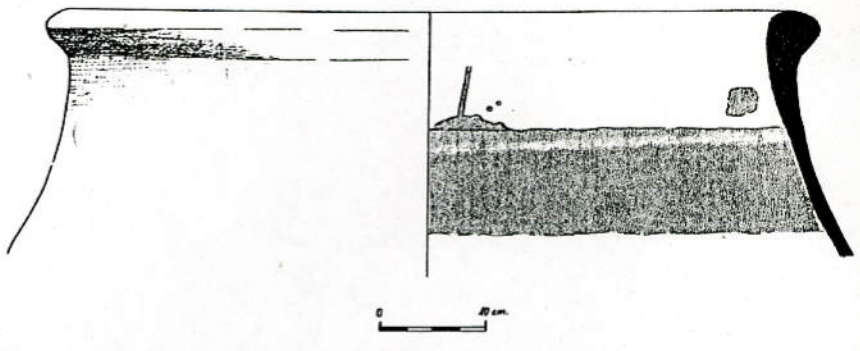

Fig. 1. Part of a vessel from Tel Shiqmona, with traces of purple dye on the interior (stippled area).

for dyeing in its reduced (leuco) form (colourless), as required for a proper dyeing procedure with the indigoid colours.[13]

The reduced dye in the inner part of the vessel did not leave any traces of colour on its walls. However, the upper part of the liquid, which was in contact with air, could not have been kept in its reduced form and was oxidized by the air, and thus the colour appeared. The organic fractions of the glands, which floated on the surface during the procedure of heating, absorbed the colour, preventing its being reduced again. This is the thin layer of colour which appears as a stripe on the inner wall of the vessels from Shiqmona and Keisan.

The material relating to the Iron Age strata has not yet been published, so for the moment it is not possible to offer a complete description of the archaeological data. Yet even from this partial information, it is evident that purple dye was produced at Shiqmona at least from the ninth century B.C.E. The findings from Tel Shiqmona are very significant, being the largest number of sherds with genuine purple dye ever to be found in an archaeological excavation. These, together with the related material, add to our knowledge of the vessels and methods used in antiquity for the preparation of the purple dye.

Tel Shiqmona, which is located on the shore, was a perfect site for the manufacture of purple dye, being close to the sea with easy access to the raw materials — the snails. It seems that the area has a tradition of being associated with dyeing. The toponomy of the area in the Hellenistic period seems to recall activities connected with purple dye, as Haifa was known as 'Porphurion'.[14] In addition, Talmudic tradition mentions that the dye snails were fished on the coast extending from the ladder of Tyre to Haifa.[15]

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[13] Purple and indigo belong to the indigoid dyes. These are very permanent dyes, not soluble in water unless alkaline is added. The wool is immersed in the reduced (leuco) solution. When it is exposed to air (or air and light) it undergoes a photochemical reaction. Once the colour appears, it is very fast, permanent, and will not wash out or fade away in water.

[14] S.E. Loewenstamm: *Argaman, Enṣ. Miqr.* 1, Jerusalem, 1955, p. 530 (Hebrew).

[15] *BT, Shabbat* 26a.