Tip Layering. *Rubus* x *loganobaccus* (loganberry), *R. fruticosus* (blackberry), *R. phoenicolasius* (Japanese wineberry), and other hybrid berries, are propagated by tip layering of the shoots. They can be propagated successfully from summer "hammer cuttings" but, at present, we find that we get a stronger plant for lining out the following year by using the tipping method. This is done using established stool plants from which the shoots have been stopped twice to provide as much tipping material as possible. Tipping is usually done in August by making a sharp angled hole about 4 to 6 inches deep into which the tip of the shoot is placed. The soil is replaced and firmed. The tip roots in about three weeks and the shoot turns back up towards the surface. The following spring the old shoot is removed completely from the stool plant and cut off a few inches above soil level at the tip. The tips are lifted and lined out in the nursery 1 ft. apart in 3 ft. rows. There is a tendency for these plants to produce only one shoot, which is not sufficient, therefore they are usually cut back to encourage branching. The ground is sprayed with Simazine after planting.

Spawn Beds. *Rubus idaeus* (raspberries) are the only plants that we produce on spawn beds. The beds are planted up with small canes, which have been cut down to 4 in. above the root, at 4 in. by 3 ft. This is done in the spring. By November of the same year the saleable canes can be dug up. Any small canes remaining are cut down and, in January, the bed is sprayed with Paraquat. The second year's canes produce a solid bed and no rows can be seen. At the end of the second year's growth the whole bed is dug up, the large canes sold and the remainder planted once more. We find that we cannot leave the canes to spawn more often than this due to weed problems. In our sandy soil couch grass grows luxuriently, appearing from nowhere, and covering a tremendous area in a season. Cultivations are not possible as there are no rows and, so far, we have not found chemical controls good or cheap enough.

ROOTING CUTTINGS UNDER POLYTHENE TUNNELS

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In this short review of the use of low polythene tunnels for rooting cuttings it will not be possible to consider all aspects of the technique. The system used at G.C.R.I. will be described and some observations will be made on its use.

The important advantages of low capital cost and labour saving come from the simplicity of the technique and I have tried, therefore, to maintain this simplicity wherever possible.

Tunnel construction. The tunnel design is basically that widely used in Great Britain for protected strawberry cropping. The wire hoops which support the polythene are bent into the required shape (Fig. 1) on a former from lengths of galvanized wire (8 swg with a tensile strength of 50 ton / in). The hoops are spaced 30 in. apart along the tunnel (Fig. 1). Polythene sheet 6 feet wide is tied to a stake at the end of the tunnel and stretched over the hoops. It is secured by lacing two lengths of polypropylene bailer twine under alternate loops on either side of the tunnel (Fig. 1). This type of construction allows the inspection of cuttings at any time by lifting the polythene at the sides of the tunnel (Fig. 2). The construction can also be mechanized to a large

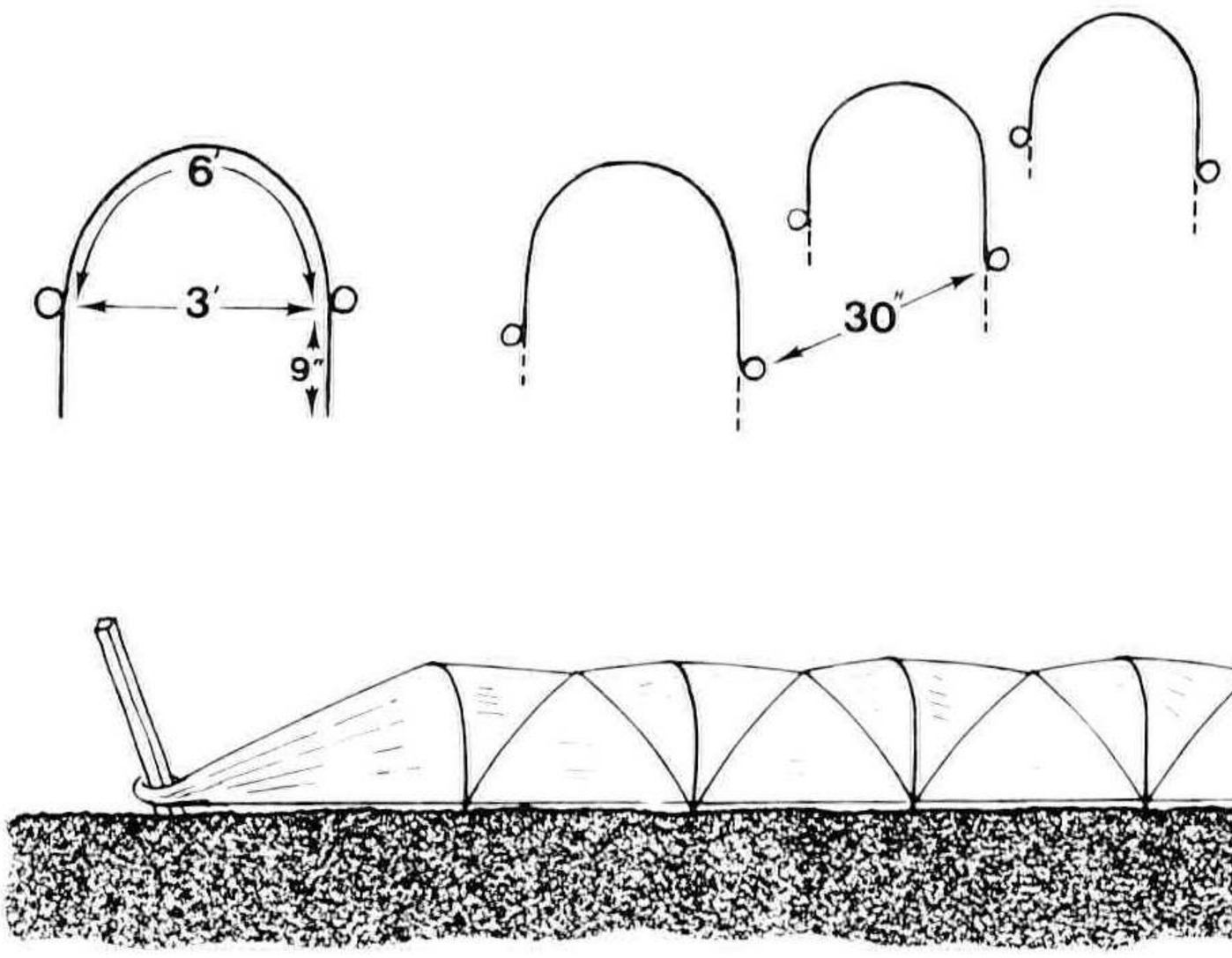

Fig. 1. *Top.* **Hoop construction.**
Left. **Dimensions.** *Right.* **Spacing.**
Bottom. **Polythene tunnel construction.**

extent with simple machinery to construct the hoops, space them out in the field and to lay out the polythene.

Weed control. Control of weeds prior to inserting the cuttings must be good because conditions are ideal for weed growth. Soil fumigants offer a safe and effective method. In trials in 1971 I compared the use of methyl bromide and Dazomet. Methyl bromide has to be applied in Great Britain by contractors and is more costly than Dazomet but it has certain advantages which are worthy of comment.

Methyl bromide is easily applied by injecting the vapour from 1 lb. canisters under polythene sheeting at the rate of 1 lb. / 100 ft. Fumigation is completed in three days and the sheet can be removed to allow aeration for a further two days.

Fig. 2. Completed tunnel with one side raised.

Application of Dazomet is a much lengthier process. The chemical is rotovated into the soil and the surface sealed by rolling and flooding or by covering with polythene sheeting. The seal can be broken after two weeks and a further two weeks are required for aeration of the soil.

Weed control with methyl bromide was excellent. Control was satisfactory with Dazomet applied in the prilled form at 300 lb. commercial product / acre but at half this rate control was very poor.

Soil preparation. After soil fumigation is completed a very simple rooting medium is prepared by turning peat into the top few inches of soil. On less well drained soil a rooting medium of peat / sand, or sand alone, on a raised bed may be required.

Irrigation. Water loss from the soil under white translucent polythene is very low and very little irrigation may be required. A simple trickle irrigation system has been used as an insurance against a prolonged hot dry spell during the propagation period. For relatively easy-to-root subjects overhead misting is not considered necessary.

Cuttings—timing, type and spacing. The simple system described is only suitable for semi-mature cuttings of relatively easy-to-root subjects. Little useful purpose would be served by listing those plants which have been successfully rooted under polythene tunnels. The propagator should use his experience with rooting of a particular plant by traditional methods to assess its potential under polythene tunnels.

Cuttings of the correct maturity are available from late June onwards. Cuttings of certain deciduous subjects must be taken early or poor overwintering will result.

Cuttings are spaced according to the vigour of the plant, 3 in. x 3 in. being the average. After rooting has taken place (a period of about four weeks with most cuttings) weaning is achieved by progressively raising the sides of the tunnel. The raised polythene can be left in position to provide shading and protection or it can be removed when weaning is completed. The cuttings are left *in situ* through the first winter and the following growing season. They are lifted the following winter as well-established field grown plants that have not suffered any of the checks to growth of lifting, potting and planting out.

Soil and air temperatures. Although a white translucent polythene film imported from Denmark has been used very successfully as a covering material for polythene tunnels, it seemed worthwhile to look at the temperature conditions obtained under this film compared with clear polythene, and to see how closely the conditions obtained fitted the known requirements for rooting cuttings. Temperature recordings were made at hourly intervals over a period of several days in the air and at various depths in the soil. The temperatures recorded on two consecutive but contrasting days are presented here (Figs. 3, 4). The first day was generally warm with long sunny periods; the second was dull, overcast and entirely sunless. During the first day the air temperature under both clear and white polythene rose above ambient, but during sunny periods undesirably high temperatures were reached under the clear polythene. Temperatures under both polythene covers and outside fell to within a few degrees during the night and the excessively high temperatures of the first day were not recorded in the second day although the same pattern was followed.

The soil temperature recorded at 1 inch depth, about the level of the base of cuttings, showed a rather different pattern. There was very

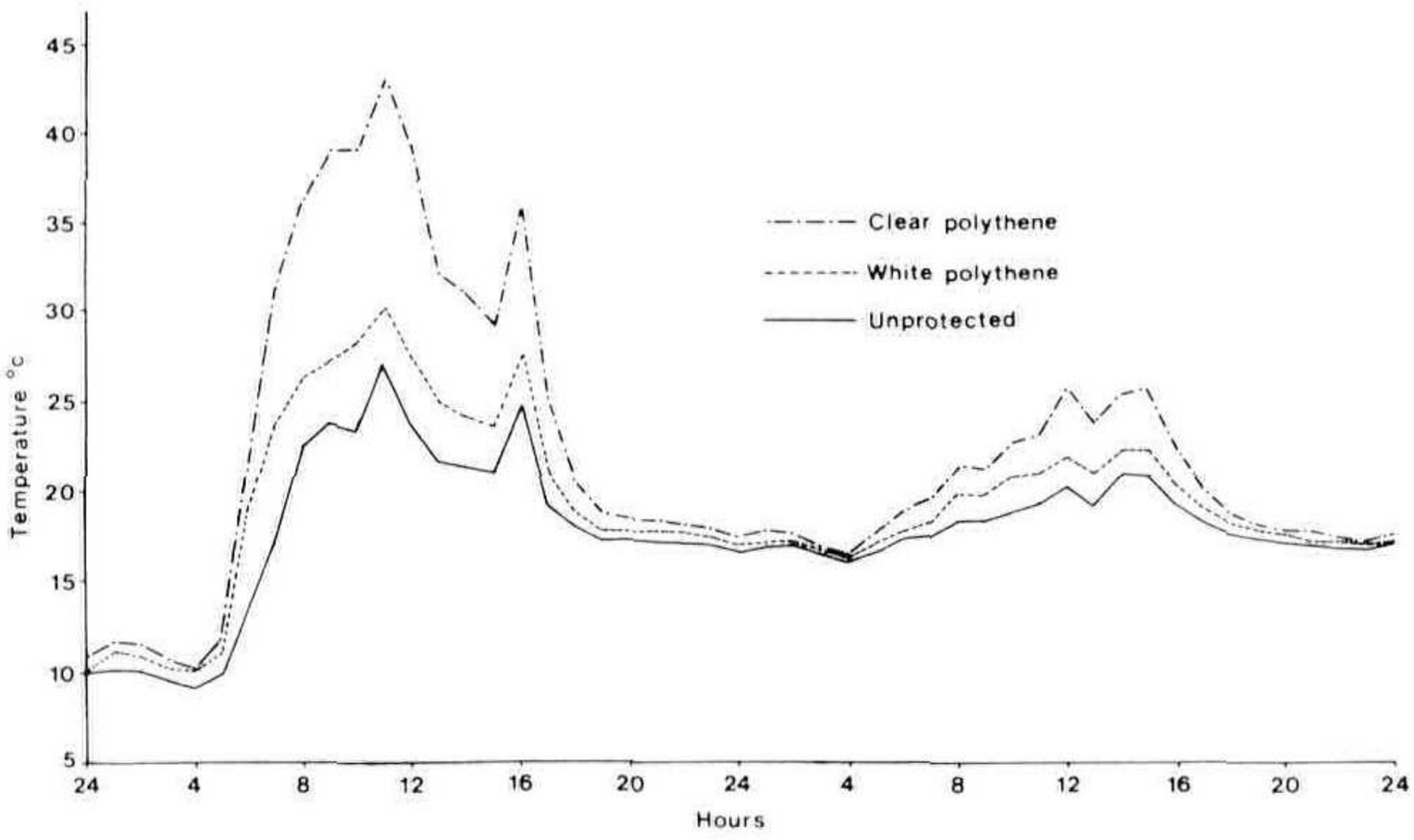

Fig. 3. Air temperature three inches above the soil surface recorded on 8, 9 August, 1971.

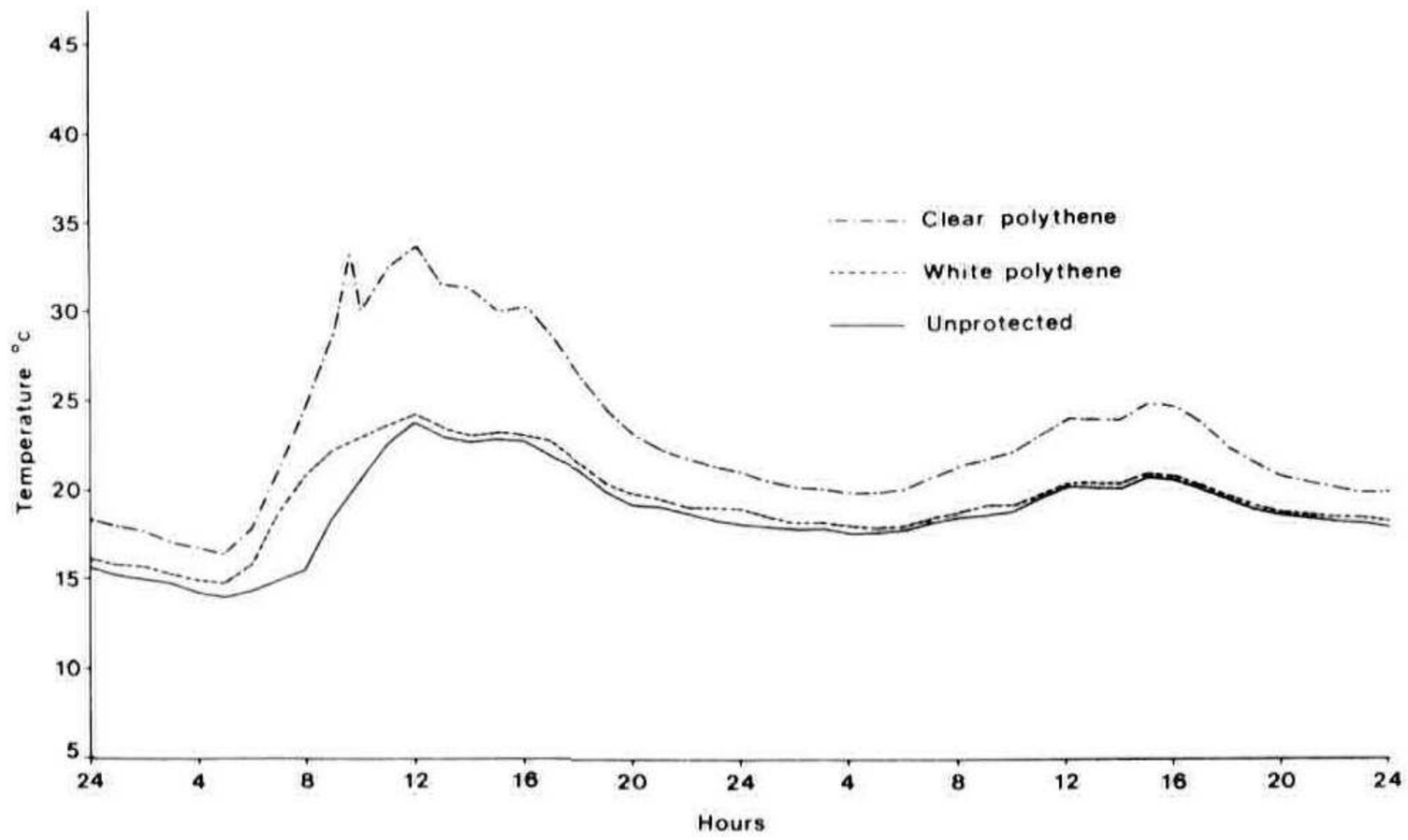

Fig. 4. Soil temperature at one inch depth recorded on 8, 9 August, 1971.

little soil warming under white polythene and temperatures at rooting level were generally sub-optimal for rooting even on the first (warm) day. Soil temperatures under clear polythene were considerably higher and there was a reservoir of soil warmth which maintained a temperature of more than 20° C. (68° F.) throughout the night. It is likely that the soil temperatures of more than 30° C. (86° F.) recorded on the first day, would be too high for satisfactory rooting of most cuttings.

The figures presented indicate that the types of polythene film available at the moment and used in these trials are not ideal as a covering for propagating tunnels. A less opaque white polythene which allows a greater degree of soil warming while still not allowing excessively high air temperatures, may be more desirable.

PROPAGATION OF MINIATURE ROSES BY CUTTINGS

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The method about to be described was developed where a few hundred plants could be produced from a few stock plants, and where facilities are limited to cold frame protection, with a slightly heated house to grow on the rooted cuttings. It was inspired by a few unsold and unpruned plants left to overwinter in a cold house. These developed dwarf shoots in March and April, which were removed, rooted and produced excellent plants by autumn.

Propagation and Production. Well grown stock plants are covered by a frame light in March to protect the breaking buds on last