A SEASON WITH A THERMAL SCREEN[1]

By Eric Wall, Pollards Nurseries

The cost and supply problems of fuel for the glasshouse industry have been foreseeable but the speed with which the situation has developed recently was less predictable. The year of 1973 was a foretaste and prompted thoughts on how to manage with less fuel.

Apart from good housekeeping there are three possibilities — change growing patterns; use lower temperatures; and reduce heat losses.

The specialist tomato grower has little scope, if any, to change his growing pattern. Shortening the season puts up all other unit costs. A later start and later finish provide only a limited fuel saving.

Some reduction in night temperatures below blueprint levels seems to have been quite widely adopted and with some justification. Since the experiments on which blueprint temperatures are based were done, the premium for early fruit compared with mid-season has declined. Earliness at the expense of yield is less worthwhile now.

In my view, reducing heat losses offers the best prospects. With this in mind, in converting this nursery from rose to tomato production, provision was made for the eventual installation of thermal screens.

The single-span glasshouses orientated east/west measure 22m by 100m with eaves at 3.3m. Overhead heating pipes were moved to the sides providing an upper rail at eaves level for the thermal screen. Another, 30cm lower, is for the crop wires which are further supported from the ground by 3m poles spaced at 3.60m by 2.70m.

The installation

Last autumn the first screen was installed as part of a Ministry Farm Development project.

The mechanical part of the installation was bought as a kit from Fordingbridge Engineering Co. This draws the screen as a single sheet across the house with the screen parked by day on the north side, so that any shadow cast by direct sun falls outside the house.

Peritherm was selected for the screen material overhead. Sides and gables had a fixed lining of clear 38 microns thick polythene.

Nursery staff carried out the installation except for electrical work and re-routing some heating mains.

Costs of thermal screens depend very much on individual circumstances. As a guide, those incurred in this case, rounded off on a per acre basis were:

	$/acre
Mechanical equipment	8277
Screen material	5874
Labour and electrical work	2403
Altering heating mains	2403
Total	18957

Another cost resulted from stopping the previous crop early. However, with the experience that has been gained a further installation could be put in with a minimum dislocation of the normal schedules.

The screen was put into operation at the end of November, used during the last two weeks of propagation and every night on the spaced out crop until April 10. Heat meters and temperature recording equipment were installed at the end of January.

The intention was to run the same day and night air temperatures in the screen house and an identical one without a screen. In practice this was not achieved. Day temperatures were similar but the night temperature pattern differed. When the screen was drawn in the evening it took longer for temperatures to fall to the night level under the screen. With the switch from night to day temperatures occurring before the screen was withdrawn at dawn temperatures rose more quickly in the screen house in the mornings.

At the time the instrumentation was put in night temperatures averaged slightly less in the screen house. An adjustment was made but when the data was processed by computer it revealed that average night temperatures from early February were higher in the screened house and the difference increased progressively to approximately 3C by late March.

Results

This complicates evaluation of results. However making allowance for the temperature differences there was a 60% reduction in heat consumption at night. Somewhat surprisingly there was a further heat saving of 25% by day. These savings indicate a 12,000 to 14,000 gal per acre reduction in fuel worth, at the heavy fuel oil prices ruling at the time, a saving of $8010 to $9345 per acre.

By the end of June yields from the screen house were five tons per acre less than the control, a difference of $9345 net of marketing costs.

The figures, as presented, don't look like a good investment so where do we go from here?

At today's oil prices the fuel saving would be worth $10,680 to $12,015. The real question seems to be whether the loss of yield can be reduced. The major factor involved was almost certainly loss of light. The polythene round the side

[1]*Reprinted from "The Grower", August 23, 1979. Dollar figures are conversions from british pounds.*

had some effect. More significant was the shade from the parked screen which had a very pronounced effect on plants nearby.

It is a matter of conjecture whether the higher humidity, the slightly lower root temperatures in the early stages or any other inherent effect of the screen on plant temperatures contributed to the reduction in yield. The higher humidity associated with the screen caused no disease problems.

The impermeability of the screen did present a continuing problem with rainwater and condensation drips accumulating on the upper surface. With only a few inches between the crop support wires and screen, small pools of water cause the screen, on retraction, to foul the crop wires.

Conclusions

The results are sufficiently encouraging to put a screen in a second house this winter, particularly in view of the current oil situation. However more experience is needed before going beyond that. It is clear that very significant fuel savings are possible. Commercially it is not a question of saving every litre of oil possible but striking the right balance between reducing heat losses and any concomitant effect on crop yield.

I think we can narrow the gap in yield between the screened and unscreened houses. Some adjustments in growing techniques are probably needed. More obviously we need to attend to the light loss aspects. Reducing the volume of the parked screen is one element; moveable side screens, at least on the south side is another.

Permeability of the screen is another essential requirement if we are to live with thermal screens throughout the nursery each season. Other minor improvements are also necessary before we have a completely satisfactory system. Ideally we should have more time to perfect what we already have before installing any more screens. Some modifications will be made to the existing one. However, with the fuel situation being as it is, the intention now is to put in a second screen this coming winter.

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