



The Mushroom Journal

CONTENTS

From the Director's desk: I've Heard that Song Before	305
MGA Affairs: 1949-1983; Brighton 1983; Brinsbury Course	307
Mushroom Marketing and Quality: <i>Dr R. L. Edwards</i>	309
History of <i>Agaricus subrufescens</i>: <i>R. W. Kerrigan</i>	313
Good-bye P. J. C. Vedder	321
Growing Pains: <i>Geoff Ganney</i>	325
Spawned Casing: <i>C. MacCanna</i>	329
Surface Structure of <i>Agaricus bisporus</i> by Scanning Electron Microscopy: <i>P. T. Atkey and R. Nichols</i>	334
New Fungicide for Mushrooms: <i>J. T. Fletcher</i>	336
Young Mushroom Growers — Timothy Cripps: <i>W. R. Alderton</i>	337
Bush Telegraph: Food from Britain; <i>Verticillium</i>	339

**OFFICIAL JOURNAL OF THE MUSHROOM GROWERS' ASSOCIATION
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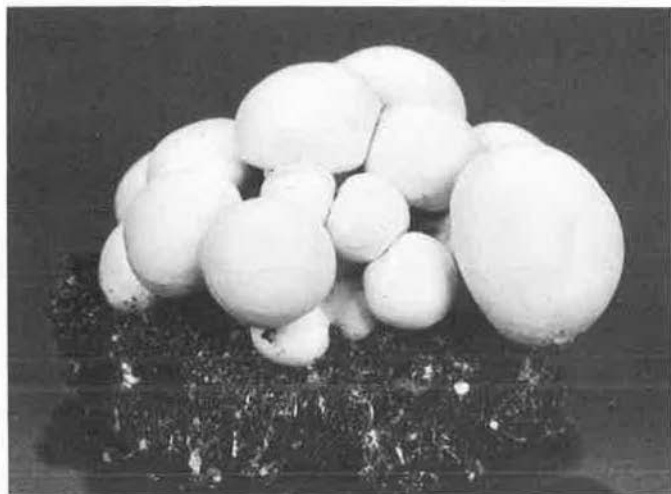
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FROM THE DIRECTOR'S DESK . . .



I'VE HEARD THAT SONG BEFORE

'It has been suggested by several growers that at present they have neither the desire, nor the need to grade. In fact, some go so far as to say that it would greatly increase their labour costs and disorganise their packing department . . . I am convinced that this short-sighted policy is due to the continued profitable market . . . However, this state of affairs is slowly, but surely, giving way to sterner times and therefore is it not time for us all to consider earnestly an improved method of marketing in readiness for keener competition? If this subject is studied from the salesman's angle, rather than that which is more convenient to the grower, then I feel that by packing and grading according to the salesman's advice as to what the buyer requires, is a means of insuring the best prices for our consignments in competition with the imported produce which is sure to increase.' The above is taken from a letter written by grower member W. A. B. Harding in July 1949 and here we are in 1983, 34 years later, having exactly the same debate. We deplore the competition from imported mushrooms. The trade laud the praises of the imported quality, yet our attitude has not moved very far from that described by Mr Harding.

We cannot complain if only two-thirds of our crop is produced as buttons of any quality. We cannot complain if the overall price of mushrooms is reduced by an excess of mushrooms on the market of low grade. Yet we continue to grumble, under our breath of course, that we can't afford extra money for grading or for packaging or for transporting.

There is a growing demand for more mushrooms. There is a future for the grower who takes

care of his product and produces good quality, well-packaged, well-transported produce, but from now on bad quality will be punished and good quality rewarded. The grower who can give the customer just that little extra will benefit. The future will be tough, hard and unyielding. It will also be very rewarding for those growers who are willing to produce what the consumer wants, when he wants it. The right type of mushroom whether that be button, cup, open cup, or open. Do not be deluded into thinking that tomorrow's customer will only want buttons. They like their open mushrooms, but they have to be of good quality, of good appearance, good pink gills and not those slimy messes one often sees for sale in some of our retail outlets; bought cheaply and sold expensively.

Associations throughout the world can do just so much for their members. They can define quality, they can help their members with information, they can teach the retailer how to handle the mushrooms and finally they can create in the minds of our consuming public the desirability, the availability of the mushrooms. They can give the housewife recipes, teaching her how to use them and use more of them, but in the end it is you, the grower, who must set your stall out to reap the benefits. Things will not happen by themselves. It seems strange, does it not, that we are still dealing with the same issues in 1983 as were gripping our attention in '45, '49, the 'sixties and 'seventies. Who was it who said, 'things change but things stay the same'? Perhaps we ought to see they did not.

D.N.L.

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Articles submitted for inclusion in the Journal are always welcome. Whilst the Editor cannot undertake to publish all the copy received, submissions will be acknowledged. Originals, wherever possible, will be returned to the contributor, who will also be notified as to if and when the article will appear.

No responsibility can be accepted by the Editor, the Editorial Board, or the Mushroom Growers' Association for statements made or views expressed in this Journal, or for any advertisements included.

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MGA AFFAIRS

1949-1983

The editorial points out this month, that we do not seem to have moved very far in the area of giving the public and the retailer what they want with regard to quality. Whereas in the area of 'instruction in identification of mites', we appear to have moved a very long way. In the *Bulletin*, as it was then called, there is a letter from Miss Hilary Ball in which she states 'instruction in identification of mites is not a subject which is taught in any institute in the world and as there are so many genera, it would be difficult to advise you on the matter of acquiring the necessary knowledge to enable you to identify them yourself'. She goes on to say 'all of which is very discouraging, but we still feel that there must be a whole lot of information available somewhere if one could only get hold of it'. When one reads the articles and looks at the pictures of flies etc, which have appeared in recent editions of the *Journal* one can only wonder at the vast strides made at GCRI and other institutes in this particular area. I wonder if we will be making the same complaints in 34 years time, as those we express at the moment.

Appreciation

Jean Neesham, Fred's daughter, has asked us to express 'thanks to all the effort that was put into the organization of the Service at Peterborough, and also to those people who spared the time away from work to pay tribute to my father. I do most sincerely appreciate everything that was done and said'.

Brighton 1983

The Brighton Conference this year, with its full programme and its provision for open discussion will, we hope, attract a large attendance, not only from growers in these islands, but from overseas. It is by the lectures and discussions which take place with attendant exchange of ideas that throw the light on the problems of our industry. With that light comes the increased knowledge and steps forward to a more efficient industry. At Brighton each and every delegate will have a chance to look, listen, to learn

and if he so wishes, to make his own contribution. The lectures and the discussions will cover a wide field of interest and within that field may well lie the key to that extra efficiency, that elusive little extra which even the most competent grower among us is seeking. The answers to the riddle may well be found at Brighton. If you have not already booked it is not too late. You will be there — of course?

Retirement

I received a note from Mr and Mrs Carew-Shaw of Courtlands Mushroom Farm, near Horley to say that after thirty-one years membership of our Association and mushroom growing, they were retiring to enjoy a little well-earned rest. We are sorry to lose them, but nevertheless wish them every health and happiness in their retirement. Thank you for all your support in the past.

Visitor

John Bazalgette, Association Director 1972-77, called in to see us on a lightning visit from Florida where he is now domiciled and working in the mushroom industry. Having collected a huge pile of literature for himself and his colleagues, he tells me that the United States industry has its problems, which appear to be very similar to our own. Good to see you, John. Call in and see us again when you are this way.

Brinsbury Course

The next Mushroom Pests and Diseases course has been booked to run from mid-day, 13th September to mid-day, 16th September, 1983. Dr Jacobs is arranging the course content, lectures, etc.

DIARY DATES

1983

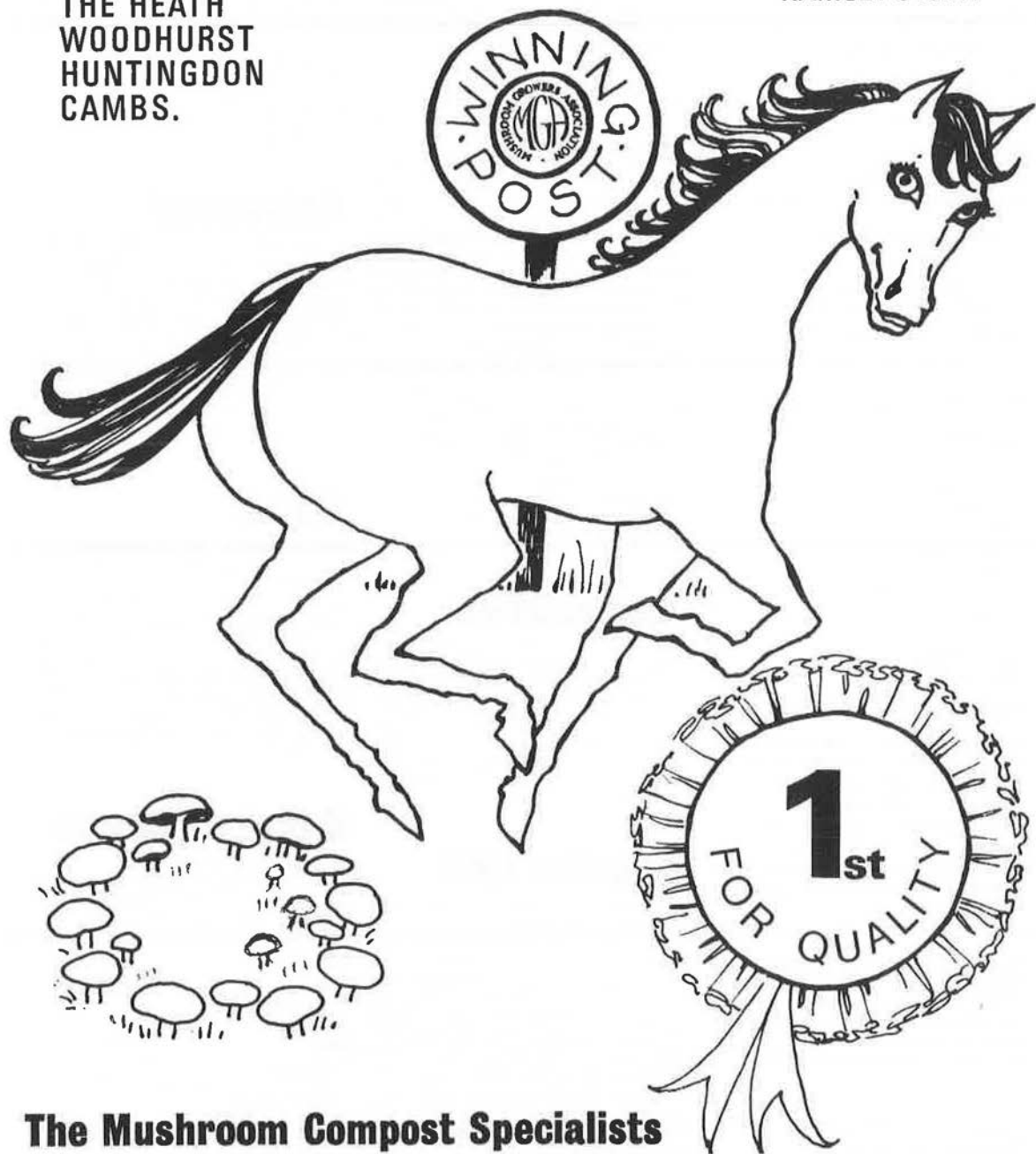
September 28 - October 1: MGA Annual Conference, Bedford Hotel, Brighton.

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Mushroom Marketing and Quality

by Dr R. L. Edwards

I had intended to raise this subject in discussion of the Publicity and Marketing Committee's Report at the AGM, but time did not permit and the Director asked me to write about it for the *Journal* instead. This will not be as satisfactory, because one can say things in discussion which look quite different when written; however, some aspects of the present situation in mushroom marketing seem to me urgent enough to justify the attempt.

The Market in Europe

For the last seven years I have represented MGA at meetings of the European Group of Mushroom Producers, where we compare production statistics and imports into Common Market countries from outside the EEC, and co-ordinate action if necessary. Most of the imports come in as canned, frozen or pickled mushrooms from the Far East. They do not directly affect our mainly fresh market very much. Most of them go to West Germany which is the largest importer, and there they compete with Dutch and French canned mushrooms exported to Germany.

Repeated representations to the EEC authorities have established controls over the volume of imports of canned mushrooms to the EEC and in the last year or two the position has been fairly stable. There are also substantial exports of fresh mushrooms from France and Holland to West Germany; German production is nearly all consumed fresh at home.

There has now been a change in that situation; due to the economic depression, the price of fresh mushrooms in Germany has fallen, so have imports, and recently Dutch fresh mushrooms have been sold in France. Poland also is increasing production and exporting to Germany. When surplus fresh mushrooms are floating about they may go anywhere; some have arrived in England and that trend may increase quite suddenly.

Publicity and Marketing

In recent years MGA Publicity and Marketing have been linked in the one Committee. Publicity

may be described as selling the *idea* of buying mushrooms. Marketing is also partly that, but must include persuading the customer (supermarket, greengrocer, housewife) actually to *buy* them. It seems to me that Marketing has always had very much the worst share of interest. In fact a few years ago Marketing was not mentioned at all in the Committee's Annual Report! Perhaps that was partly because Publicity was already firmly established as an MGA activity, and partly because it is easier.

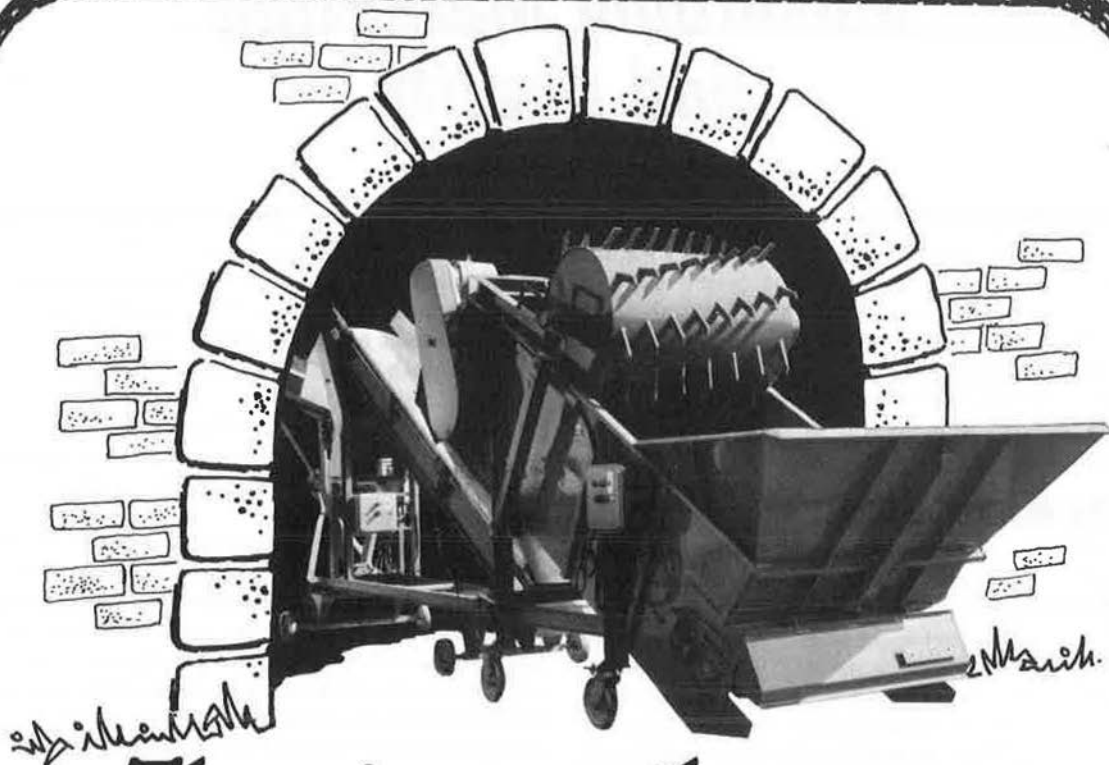
Some years ago a mushroom marketing survey showed that the most decisive single factor influencing consumer purchases was appearance. All too often their appearance is awful. That may be the fault of the grower, the distributive chain if any, the retailer, or any combination of them all. I have been looking at mushrooms with a professional eye for over thirty-five years, long enough to be fairly certain when mushrooms which look awful in a shop could never have looked good enough to be a credit to their grower.

Why?

So why are so many low grade mushrooms grown *here*? I emphasize 'here' because I also see mushrooms on sale from time to time in Continental countries and the average quality is much better than ours.

I think it is common knowledge that some changes in growing practices in Holland, particularly mechanical harvesting, have caused a great increase in their proportion of Grade III mushrooms. They have taken that so seriously that their Experiment Station has given top priority for the next few years to research on improving quality. French mushrooms are grown in caves, at lower temperature than those prevalent in our cropping houses.

I am sure environmental conditions cause some of our trouble. Two objectives have been given high priority in developments here in the last 10-20 years. One is to put as many trays as possible, and therefore as much compost as possible, into



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each cropping house so that it would give maximum output. That *seemed* a logical aim to all of us; I no longer think it is. The other is to produce successive flushes at intervals of seven to eight days so that most of the output in the first (and largest) three flushes can be harvested on Tuesday, Wednesday, Thursday to meet marketing demand.

To discuss that one first; it requires cropping at temperatures over 60°F, which makes control of moisture on beds and in the air more difficult, and also makes growth *and opening of the veil* more rapid. I still remember the superbly firm, solid mushrooms we grew years ago when the house was cooled down to delay a flush over Christmas.

Packing in the maximum of trays had led to the transverse block layout, because more can be packed in, at the same height of stacking, than if they are lined up as shelves are. It is much easier to give an air supply of uniform quality and rate of flow across two longitudinal blocks of trays, than over transverse blocks.

Another possible factor, suggested to me by another past chairman of MGA, is the development of high yielding strains of spawn which may have coupled with high productivity a tendency to give 'soft' mushrooms.

So what should we be doing?

There are several aspects: cultural; what can be done to improve the average level of quality and particularly to eliminate the worst? Economic; does the cash benefit for getting most of the mushrooms on those middle days of the week outweigh the lower price where many of them, because of the pressure of timing, are of poorer quality?

Can cold storage, possibly with more sophisticated management, reduce deterioration after picking? And would a return to lower yielding strains, which give better quality mushrooms, show that the bonus for quality outweighs the reduction in yield? Good quality mushrooms are cheaper to pick.

The answers to these economic questions depend very much on the state of the market. If that deteriorates, with a lot of competition from Continental imports, the bonus for quality is likely to increase. Where there was a great increase in Grade III mushrooms in Holland their price fell sharply; and that could happen here if a lot of

Grade I mushrooms, which they would be, come in.

There is another area which desperately needs attention: point-of-sale. The way mushrooms are often handled and displayed, particularly loose, does nothing to improve their shelf life, and buying for half the week on Monday, as some retailers do, without cold storage, is appalling. MGA used to have Couriers whose job was to visit retail outlets, handing out P-o-S literature, and encouraging good handling as part of general promotion. I do not know how effective that was, but it is certainly part of Marketing.

Cultural effects

Returning to the grower's own contribution: accurate information is essential for effective action and here computers can help enormously. Many growers now have a small computer and they are ideal, if suitably programmed, to collect and relate an assessment of quality of individual flushes, crops, or any other desired unit, to the strain of spawn, cultural and environmental details. They can also turn these data into cash terms if the relative prices are fed in. Mushroom growers generally understand and appreciate pounds better than percent relative humidity, even though the former may depend on, and is less controllable than, the latter.

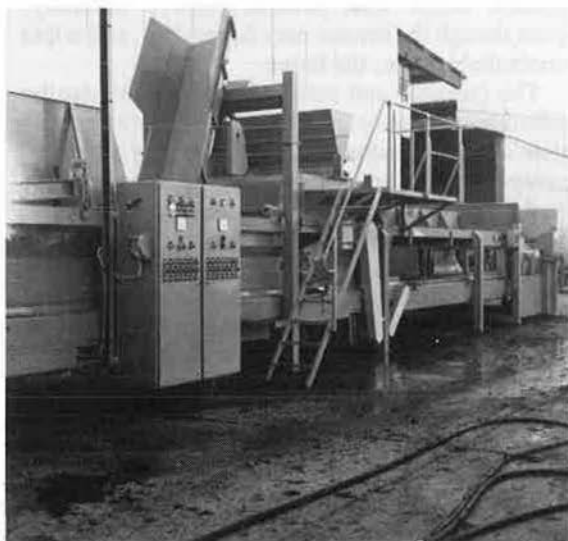
The Director and staff at GCRI might also be asked to add some quality data to their records with similar objectives, and I think they would be sympathetic, particularly if they see growers making an effort on their own account. And Lee Valley EHS could be asked to do the same.

Any grower who does not believe this is a serious matter could take two average mushroom-buying housewives round a random dozen green-grocers and then take them to Boulogne, Calais or Paris to look at the mushrooms on display. I am sure the housewives' comments would be interesting but they might be more suitable for the *Director's Notes* than for the *Journal*.

I have no commercial involvement in the British Mushroom Industry, but after working for it in a wide range of capacities for thirty-seven years, I should hate to see it going down hill because it neglects the quality of its product.

Ron Edwards has pulled no punches in this article. What about it? Is there a grower who'll respond? Perhaps more to the point, is there one who won't? — **Ed.**

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History and biology of *Agaricus subrufescens*

by Richard W. Kerrigan

Herbarium, Biology Department, San Francisco State University, USA

In the not too distant past, the makers of mushroom spawn as well as some mushroom growers would gather 'virgin spawn' in the form of vegetative mycelium associated with fruitings of likely-looking mushrooms in fields, mill-tracks, farmyards, and similar places. It should not be too surprising, therefore, that species of mushrooms other than *Agaricus bisporus* (Lange) Imbach were sometimes introduced into cultivation. Such an event occurred in New York in 1892.

William Falconer, credited with authorship of the first American book on mushroom culture, noticed that summer a mushroom new to him growing prolifically on a huge pile of decomposing leaves. He soon discovered that the same mushroom had appeared all over the property of a neighbouring florist, in hothouse flower beds as well as in asparagus beds out in the pear orchard. The florist welcomed this volunteer crop, which was 'coming up like a crop of weeds', picking 'an average of 35 pounds of them a day and getting 80 to 95 cents a pound for them in New York' (Falconer, 1894).

Falconer sent specimens of this mushroom to the New York State Botanist, C. H. Peck, who concluded that it was also new to science and named it *Agaricus subrufescens* (Peck, 1893). Although Falconer apparently did not attempt to cultivate it himself, spawn of *A. subrufescens* began to be offered for sale almost immediately (at 'prohibitory' prices), and after the 1893 season he reported the experiences of several growers who had tried the 'new' mushroom. Meanwhile, an 'enormous volunteer crop' appeared in the greenhouse of Col. Wright Rives of Washington, D.C. Some fresh specimens were sent to Peck, arriving in good enough condition after seventy-two hours transit to be described, illustrated, and eaten for supper (Peck, 1897). The flavour and odour, for the first time, was compared to that of almonds.

This recalls the *A. amygdalinus* of M. A. Curtis, a fungus he often wrote about but never validly

published. In a pre-1870 letter to the Reverend W. Berkeley of England, he deemed it 'the most palatable of all mushrooms, as it leaves a very agreeable aftertaste upon the palate, fully equal to that of almonds. This is the thing I sent you some years since for cultivation, but which failed to grow' (Robinson, 1870). W. G. Farlow (1894) asserted, largely on the basis of odour, that *A. amygdalinus*, *A. subrufescens*, and *A. fabaceus* Berk. (all American fungi) were all a single species. Whether this interpretation is correct or not, Curtis's latin suggests an appropriate common name for *A. subrufescens*: the almond mushroom.

Many of these authors praised the esculent qualities of this mushroom, as did Murrill (1922; 'excellent') and Charles (1946; 'splendid'). Various claims were also made by the early authors regarding cultivation of the almond mushroom. It was known to tolerate or even require warm weather for fruiting and, compared to 'the common mushroom' (*A. bisporus*) *A. subrufescens* was claimed to be more productive, to appear earlier and develop faster (thus having fewer insect problems), to have a greater tolerance for unfavourable conditions, a larger size, and a better storage life. In particular it was recommended for 'private individuals who are often disappointed in their efforts to raise mushrooms' (Peck, 1897). In 1904 the Boston Mycological Club issued a bulletin to alert members to the new presence of this marketable mushroom which 'forced itself so persistently and abundantly' upon the owners of several greenhouses in that area, where it had 'taken possession of some rich portion of soil, and then sends its abundant fruits to the light, undaunted by any overlying difficulties'.

Falconer (1894) did point out some problems with the almond mushroom. It looked more like a toadstool to the produce brokers, who at times refused to accept shipments of it; all mushrooms, even to the new 'exotics' of the present time, have

Disease a problem?



VERTICILLIUM

1. Verticillium spore emerging from mushroom hypha



MYCOGONE

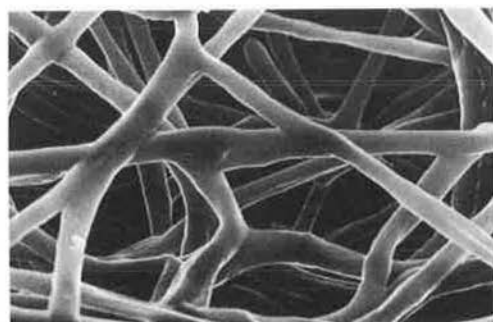
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HEALTHY FRUITING BODY

4. Micrograph of healthy mushroom

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SEM Scanning Electron Micrographs by Peter Atkey



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probably faced similar resistance in the market. Worse, the growers he corresponded with found the mushroom to be quirky, prolific in one bed and dormant in the next. This can be explained at least in part by very limited experience (one or at most two seasons) with *A. subrufescens*. Even then they had begun to discover the heat requirement of this mushroom, which was quite different from the cooler temperatures favoured by the more familiar *A. bisporus*, and some growers concluded that it also required more water.

Until very recently the only careful study of the growth of *A. subrufescens* was that of B. M. Duggar (1905, 1920). He found that it required a more completely fermented compost and a higher temperature, but for him it grew more slowly and produced less prolifically than did *A. bisporus*. This may have been due to twenty-five years of progress in growing *A. bisporus* since Falconer's time; the standard conditions for growing mushrooms may have shifted away from those preferred by the almond mushroom. In any event, by the time that the pure-culture spawn industry became established, interest in growing *A. subrufescens* had apparently waned. For over fifty years there is no record of its cultivation, and the mushroom that for a few years was a familiar visitor in gardens and hothouses in the north-eastern United States has since been only rarely encountered, in a semi-wild or wild state.

While in Japan a few years ago, I was shown photographs by Mr S. Minoura of a mushroom, growing in ridged beds, that almost certainly was *A. subrufescens*. He explained that its sweet flavour and general appearance caused it to be grown as a 'false matsutake' and sold to the unwary; the true matsutake, *Tricholoma matsutake* (Ito et Imai) Sing., is a wild, mycorrhizal mushroom that is gathered for a few weeks each fall and may sell for well over \$100.00/lb. There is apparently no interest there in growing the almond mushroom for its own sake.

The only report of *A. subrufescens* from the western United States, until recently, was that of Zeller (1922), who described pilei 26 cm broad. I was therefore particularly interested when some unfamiliar mushrooms that had been discovered in a garden 100 km south of San Francisco, California turned out to be this fungus.

An 83-year-old man had terraced a sandy hillside for the cultivation of berries and vegetables, by hand-digging trenches approximately 1 m deep, 3 m wide, and 33 m long. One or two of these were re-dug annually, filled with layers of stable manure (bulked by hardwood shavings rather than straw) and plant debris, then re-covered with sandy soil. After some months wait he would lay drip irrigation lines and plant his crop. When I visited the site, he was in the habit of going out with a shovel in the mornings and



Fig. 1. *Agaricus subrufescens* growing in ridged beds, Japan. Photograph courtesy of Mr S. Minoura



Fig. 2. *Agaricus subrufescens* in pot culture on commercial compost



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hacking down the troops of mushrooms he mistakenly believed were parasitizing his berry plants. Excavation revealed the manure-compost substrate completely colonized by the almond-fragrant mycelium. From this extended thickened mycelial strands for up to 30 cm, directly to the water lines, where the carpophores were produced in abundance.

A brief description of these mushrooms follows: Pileus at first typically cylindrical or sub-globose, becoming convex to slightly truncate, ultimately about plane and 10–20 cm broad, covered with reddish-brown (or pallid) squamules; context moderately firm, white, 1–2 cm thick, not discolouring when cut, odour and taste sweet, pleasant, of almonds; lamellae to 10 mm broad, first white, then pinkish, finally dark brown sometimes faintly marginate.

Stipe equal or slightly bulbous, 8–15 cm long \times 1.5–2.5 cm broad (to 4 cm across the base), interior white, stuffed-hollow, exterior whitish, slightly floccose below the thick, flaring, pendant annulus, base subtended by copious, branching white mycelial strands up to 3 mm thick and several cm long.

Basidiospores dark brown, ellipsoid, average size $6.1 \times 4.4 \mu\text{m}$, range (5.3–5.6–) 6.1 (–6.8–7.5) \times (4.1–) 4.4 (–4.5–4.9) μm , $N = 40$, $C = 2$, lacking a germ pore; basidia predominately tetrasporic, cylindroclavate, $15\text{--}18 \times 6 \mu\text{m}$; cheilocystidia abundant, subglobose to elongate or catenulate, $5\text{--}22 \times 4\text{--}8 \mu\text{m}$. 3% KOH on pileus surface yellow; aniline oil \times HNO_3 orange-red.

Caespitose or densely gregarious in a manured garden, Santa Cruz Co., CA, USA, summer and early fall.

Some preliminary cultural studies have been carried out on a tissue culture prepared from one of these carpophores. Although these trials were of a rather informal nature, they provide some interesting insights into the growth of *A. subrufescens*. The mycelium grows out on at least one agar medium at roughly the same rate as the control strain of *A. bisporus* (a commercial white strain). It also grows rapidly on both chalked and unchalked grain.

It is slower to colonize commercially prepared, pasteurized compost than *A. bisporus*, at least at 21°C and below. On the other hand *A. subrufescens* was able to grow in compost at 32°C, while *A. bisporus* failed to grow at all. *Agaricus subrufescens* was also seen to slowly colonize

various old, unpasteurized composts which *A. bisporus* could not. The almond mushroom has proved quite easy to naturalize in my own garden, where it produced crops every ten days from the end of May until mid-November. In identical pot-cultures, it fruited fairly well at home, under simple conditions, while under controlled conditions at a local mushroom farm it produced strandy mycelium but no primordia, probably due to the cooler temperature.

Initiation of primordia of *A. subrufescens* requires fewer, or different, stimuli than does *A. bisporus*. As with some other almond-fragrant species in section *Arvenses* (e.g. *A. arvensis* Schaeff., *A. augustus* Fr.), the casing layer is not essential for the initiation of carpophores. Large primordia of *A. subrufescens* were formed on agar media containing malt extract, and primordia and carpophores frequently are produced on uncased compost, even in loosely closed containers where a high CO_2 level must surely exist. Primordia and buttons are perhaps unique in the genus in that the stipe diameter may be several times that of the young pileus. Stature of the carpophore may be regulated by CO_2 level, since squat, hefty mushrooms are typically produced outdoors, while in closed bags a slender, erect mushroom may be produced. Several persons who sampled these crops rate them highly in comparison to *A. bisporus*.

As regards initiation temperature, my experiences agree with those of the last century as well as



Fig. 3. *Agaricus subrufescens* from a vegetable bed in the author's garden

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the recent study by Tu and Lin (1981) in Taiwan. As it appears to also be able to grow at elevated temperatures, *A. subrufescens* would seem well suited to warm growing conditions, and perhaps bulk or deep trough systems in particular. Its ability to colonize composts of dubious quality may indicate relatively greater nutritional versatility or disease resistance. As its close relatives have been found to be heterothallic (Elliott, 1978), it seems likely that *A. subrufescens* can be improved by a conventional breeding programme.

Much work remains to be done before the biological and commercial potential of *A. subrufescens* can be fairly assessed. In view of what is already known about it, and given the presently increasing interest in, and acceptance of, new and exotic mushrooms in the market-place, such research appears worthwhile.

ACKNOWLEDGEMENTS

I would like to thank Harry for allowing me to dig up part of his garden, and to take specimens there; Mr S. Minoura of Tokyo for information and photographs; Mr E. Nagasawa of the Tottori Mycological Institute for additional information;

and Ms G. Kaye of the Farlow Herbarium for copies of Falconer's and Farlow's papers.

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Good-bye P. J. C. Vedder

As you may have seen in the last number of *Champignoncultuur*, P. J. C. Vedder retired on 1st August as Director of the Centre for Instruction in Mushroom Production. He will take up a job in the United States afterwards.

In the past years, Vedder has made a considerable contribution to the development of Dutch mushroom production. As an eminent mushroom expert, and a gifted teacher, he expanded the CCO to an institution which is greatly valued and admired, not only at national level, but also internationally. The governing body regard his departure as a great loss to Dutch mushroom production.

Pieter writes:

'Obviously, there have been quite a number of comments in the recent past about my going to leave the CCO. Perhaps, the readers of this magazine should be given some additional information.

From the moment I first made acquaintance with mushroom production in 1956, I have always considered it to be a very absorbing sector in which developments were almost as rapid as the growth of the crop. In particular, in the early period between 1958 and 1970, the work under the guidance of Mr Bels was characterised by a high degree of personal involvement in the successes and failures of growers. Such a degree of involvement implies that there is quite a lot of pressure but it also implies a great deal of work satisfaction. I have always derived much pleasure from my advisory and teaching work. Looking back over more than 25 years in Dutch mushroom production, the most striking factor seems to be the fact that it was a constant challenge. For somebody who was fully involved, there was always something new to discover, something new to build up, or to develop. My somewhat restless nature, my love of travelling and of making contacts and seeing something of the world more or less pre-determined the step which I am going to take now and of which I have spoken quite openly over quite a long period. Through articles in the professional press and others, most Dutch mushroom growers will know that I always had many contacts with foreign institutions and enterprises. In my so-called free time I was

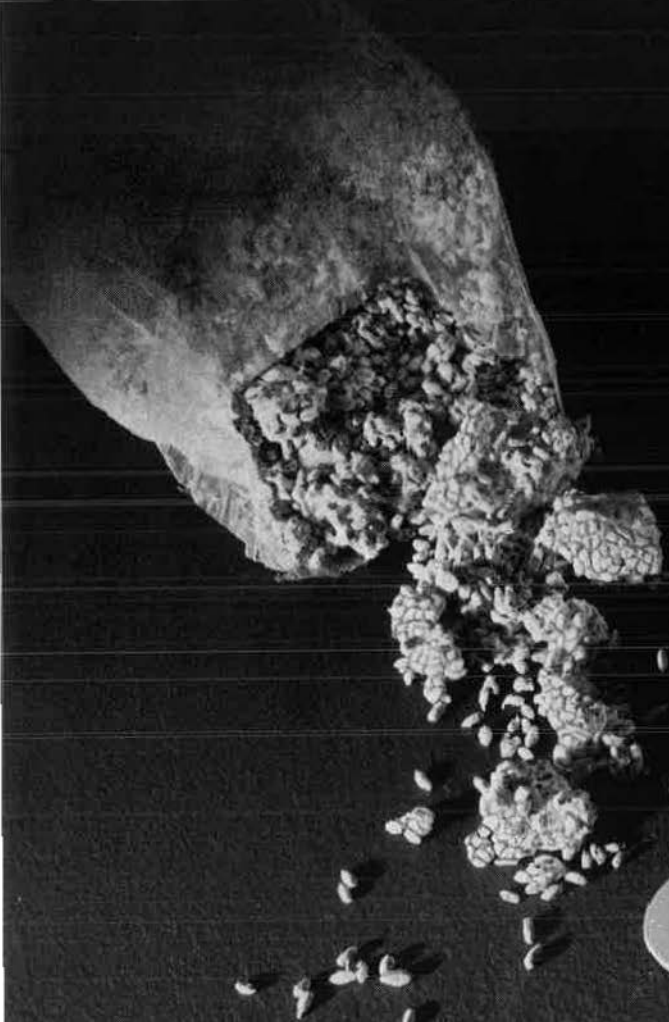
involved to a certain extent in a project in Indonesia and I also kept up close contacts with the Campbell soup firm in America which in addition to other activities also produces approximately 25 million kg mushroom per year.

Obviously, such enterprises from time to time made me offers and very good offers, to come and work for them. In principle, I was always quite tempted, especially to make such a move for the last stage of my working life. When I had to make a decision it was not easy to choose between Indonesia and the United States. In both countries, extremely interesting jobs were available offering new challenges. My heart pushed me towards the job in Indonesia but my head and a number of other factors, finally made me decide to accept the job in America.

I have been appointed as from 1st August as Vice-President Training and Development of Campbell Soup Mushroom Division in Dublin, in the State of Georgia. At this moment, a group of enterprises (Veclap) in Dublin are building a new mushroom growing enterprise with a yearly production capacity of approximately 3 million kg which is to be doubled at a later stage and the entire enterprise is built on the basis of the modern Dutch bed-system. All machinery for composting, filling and emptying the tunnels and all machinery for the growing of mushrooms will be supplied by Dutch enterprises. An instruction unit for training and teaching staff of the nine mushroom enterprises which Campbell has in different parts of the United States will be built as part of this enterprise.

Furthermore, I will be involved in all sorts of discussions on problems on the enterprises and together with the present management team, we will have to try to increase the profitability of the existing enterprises to the highest possible level. We have gained a lot of experience in recent years in all these matters. Of course I am very well aware that the new job in new surroundings will bring all sorts of surprises pleasant and otherwise. We shall discover new things and we shall miss things we are used to. However, I will not miss mushrooms because we'll be sitting right in the middle of them. However, I shall miss many people with whom I have worked so pleasantly together over so many years.'

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Growing Pains



1st July 1983

Discussing merits of strengthened plastic and polythene coverings for mushroom sheds with Edward Way and he assures me that the use of polythene manufactured with high quality polymers is the most economic! Coupled with 4% carbon black to prevent light penetration and UV breakdown provides a tremendous life for the type of film. Certainly the cost is vastly different and he may well have a very valid point . . .

2nd July

Greatly saddened at the sudden death of Peter Middlebrook and our thoughts go out to the family.

4th July

Build-up of temperature causing problems, with too many open mushrooms and no doubt it would be gratifying to have a large bank of cooling; although the thought of signing the cheque for the installation is somewhat daunting. If the heat continues we will probably be reflecting on whether we have chosen the right strain for these conditions or learning if the new strains are suited to such conditions after all!

Changes in the environment, whether the 'micro' or 'macro', the physical condition of the casing material, compost and watering can completely alter the fruit-body appearance of an individual mushroom strain. In fact, assessment of new strains under too narrow a field of commercial conditions can be misleading when a strain is released.

5th July

Received a telephone call from someone concerned about red mould growing from beneath

the casing and gradually colonizing the surface in dense patches, forming huge clouds of dust (spores!) in the air when these patches were disturbed! Was it contagious? Enough to make me put down the telephone damned quickly . . .

6th July

Travelled with Jim to Selby to attend the funeral service for Peter Middlebrook, in common with a great many other mushroom growers. Stan Maney's address was fitting to a very moving occasion.

7th July

Attention to detail and non-acceptance of an inferior standard of work *when it is known to be so*, should be imprinted on every growers' mind.

8th July

I suppose the thought of red spores floating around the farm in their trillions forced the old brainbox to think about filtration. Maybe it was not that, but seeing Tom Figgis on the list of contributors at the Conference to be held in Brighton in September and knowing that the subject was bound to be raised. What filtration is necessary and effective in its installation and maintenance on a mushroom farm is a subject of debate. We have none, others have some, some have much! Who has checked the leaks on their tunnel inlet filters? It's when the fans are turned off . . .

9th July

Winter wheat is ripening quickly with increased ambient temperatures and the quality of straw looks to be very reasonable after such a wet spring.

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With shortages of manure due to more shavings for bedding being used and the usual summer horse recess, we may be using this year's harvest earlier than usual. Gave some thought to a lower density fill coupled with supplementation at spawning.

Recent discussions with a young enthusiastic hortiscientist who was trying to persuade me to crop on a mixture of peat and ground bark left me unenthusiastic. Maybe we will not progress, as he politely put it, but straw and horses have done pretty well for a number of years. Suggestions of sand culture a couple of decades ago didn't frighten the horses into extinction and I doubt that peat and bark will do!

10th July

Made final arrangements to attend the North American Conference in Vancouver with Charles Spencer and Tony Claxton. Looks as though it should be a fairly quiet trip! Checked on travel insurance only to find medical coverage far too low.

Departed for holiday on Norfolk coast!

23rd July

Most sorry to learn of the loss of John Stewart-Wood in a flying accident and also to have missed the chance to attend the funeral service at Brize Norton due to holidays.

25th July

At last the wholesale prices have taken on a more joyous look and according to the *Fruit Trades Journal*, Manchester prices of 350-360p a basket were some of the highest known for the time of year! Not surprising, as everything has been cooked!

26th July

Without question hygiene is one of the major fundamental factors in mushroom growing and yet is often neglected by the research and development workers. Growers can inadvisedly spray a whole host of chemical compounds around their farms without having specifically designed programmes based on sound technical knowledge. Continual use of a single band of chemicals will surely lead to tolerance of bacteria or fungal spores to such chemicals. A situation not dissimilar to Benomyl and even reaching the stage where

such a chemical acts as a food source! Please can we have a regular updating system around a sound programme now that there is a Pest and Disease Development Unit at the Lea Valley EHS?

27th July

Moving cased trays from the preparation area to cropping sheds is a nightmare today with clouds of dust billowing into the atmosphere and no doubt settling on the casing. Thoughts of *Verticillium*, *Mycogone* or worse (what could be worse *Cladobotryum*?) sent us dashing for the formalin and a quick spray over the casing. Can't do any harm, can it?

28th July

Few more Sciarids active with the higher temperatures, which I imagine is shortening the life-cycle or maybe it is reducing the effectiveness of Diazinon granules at the higher bed temperatures? Perhaps efficiency of granules in large trays is less than small trays with lower temperatures . . .

29th July

MAFF leaflet issued from Nottingham on straw disposal caught my attention and some of it makes joyous reading! Baling, for example, only removes 1.6 t/ha dry matter and still leaves 1.8 t/ha dry matter to contend with, causing problems of drill penetration, trash, disease, and weed control. Alternative uses of straw do not engender enthusiasm, viz. *Animal feed* needs a chemical treatment; as *Fuel* it is bulky and labour intensive; *Fertilizer* as farmyard manure and miscellaneous uses (I am looking for the word mushroom but am consoled with . . .) ranging from thatching to archery targets . . .

In conclusion it leaves *no doubt* that the best method of disposal is to burn, but without causing damage to the environment!

Quickly looked up telephone number of enthusiastic hortiscientist to get his recipe for peat and bark compost!

31st July

Sixteen days with temperatures into the mid 80°F has broken all records for heat in July this century! This we know! Has anyone any mushrooms . . .

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Spawned Casing

by Cathal MacCanna

Kinsealy Research Centre, Dublin 5

The efficient harvesting of good quality mushrooms is a key operation on every mushroom farm. Speed and ease of harvesting is best when the mushrooms occur singly in even flushes on the cropping surface. Poor quality and slower harvesting results when mushrooms develop under the surface of the casing layer or are too tightly packed in clumps on the beds. Uniform flushing of singly occurring mushrooms is also a likely prerequisite for the future development of selective automatic harvesting. Growers using traditional methods frequently have substantial proportions of their crops initiating mushrooms below the casing surface and growing in clumps.

The 'spawned casing' technique has the potential of being an important tool in the regulation of flushing and production of easily harvested high quality mushrooms. The technique was first discovered at Kinsealy Research Station in 1969 where it was observed that mushroom initials appeared early in portions of the growing bed where spawn-run compost had become mixed with the casing (1, 2.). Such mixing can often occur due to rodent infestation or more commonly in the careless replacement of handfuls of compost or casing lifted for inspection.

Effects of 'spawned casing'

The technique consists of the addition of a small amount of spawn-run compost to the casing layer at casing time. This addition has the effect of assisting a rapid and even growth of mycelium through the casing layer with the following effects:

1. Earlier cropping: harvesting can commence 16-17 days after casing instead of the usual 20-21 days. A light pre-flush at this stage reduces the density of mushrooms in subsequent flushes.
2. Individually spaced mushrooms: mushrooms occur singly with the virtual elimination of clumping. This allows picking rates to be significantly increased.
3. Surface pinned mushrooms: pinning under the surface of the casing layer with the subsequent occurrence of mushrooms with peat particles attached is avoided.

4. Management simplified: the evenness of mycelial growth throughout the entire casing allows watering, temperature and ventilation routines to be simplified.

Other techniques

'Spawned Casing' should not be confused with two other techniques, viz. 'scratching' and 'ruffling' of the casing layer. Scratching of the surface of the casing layer is done to break up surface compaction and reduce CO₂ levels. This technique was mainly used in the Netherlands where experiments have indicated (3) that compaction of the casing layer to retain CO₂ and subsequent scratching to release it gave better yields and encouraged fruit-body initiation near the surface. A much more vigorous scratching practice has since developed in the Netherlands known as 'ruffling,' where the entire casing layer down to the compost surface is rotated mechanically when the mycelium has developed about three-quarters way into the casing layer. The use of this technique gives even flushing, similar to the 'spawned casing' technique, without however, advancing cropping.

Theories on the 'spawned casing' effect

The effects of 'scratching', 'ruffling' and 'spawned casing' are similar. It is probable that each of the techniques acts by equalizing mycelial growth in the casing layer. 'Scratching' and 'ruffling' can be considered as two levels of thoroughness in mixing mycelium through the casing before the fruit-body initiation stage (Fig. 1). Spawned casing provides an evenly distributed mycelial inoculum in a different way (Fig. 2).

An equal distribution of mycelium throughout the casing layer ensures that all mycelium at the bed surface is at the same stage of development and has equal access to nutrition from the compost. Consequently competition among mushroom initials and groups of initials is equalized allowing even development without clumping or underpinning. Lack of evenness at the

bed surface caused by an uneven compost or casing layer is avoided.

It is unlikely that it is the accumulation and subsequent release of CO_2 in the casing layer in the 'scratching' and 'ruffling' techniques which causes the beneficial effects as has been suggested. 'Spawned casing' achieves the same results without disturbance of the casing layer. A further theory (4) that the addition of spawn-run compost has its effect by aerating the casing layer is unlikely due to the small amount of compost used. Efforts to substantiate this theory with the addition of inert materials to the casing have not been consistently successful.

The discrepancy in time of harvesting between the three systems can be explained by the disturbance caused to the growing mycelium. With 'scratching' and 'ruffling' the mycelium is broken up and must re-anastomose causing a slight delay in crop commencement. Using 'spawned casing' growth already made in the casing layer by mycelium from the compost particles anastomoses without check and gives a gain in cropping time.

The procedures for 'spawned casing'

It is vital in the 'spawned casing' techniques that the compost to be mixed into the casing layer is

well run and disease-free. No system of compost selection can be guaranteed to be disease-free, but the commonsense precaution of selecting from areas where no trace of disease or compost defect is evident should be taken. Some growers are particularly careful and spawn-run the required amount of compost in plastic bags.

A further precaution against disease introduction on a large scale is to limit the amount of casing inoculated with compost from a single source by adopting a batching system. Compost from one tray, bag or other container should only be used for a small proportion of the area to be cased, e.g. 5%. In this way a chance infection will be limited to the area inoculated.

These simple precautions should be sufficient to ensure that the use of 'spawned casing' carries no more risk than any of the other operations on the farm. Further precautions are to use the same spawn strain for the casing as for the compost and not to add substantially too little or too much compost. Overspawning of the compost to ensure a good spawn-run could lead to an excess of inactive tissue in the casing. Manure spawn could replace the spawn-run compost, but the 'spawned casing' effect is not achieved if grain spawn is used.

The amount of compost added to the casing is approximately 500 g/m^2 (1 lb/10 sq. ft) to a casing layer 4–5 cm deep. Too little will reduce the effect of the treatment, too much will lead to small

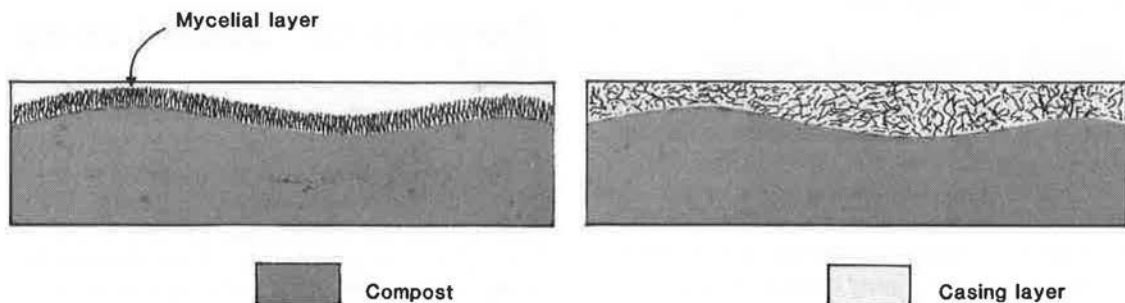


Fig. 1. Equalizing mycelium growth in the casing by ruffling: (left) before ruffling; (right) after ruffling.

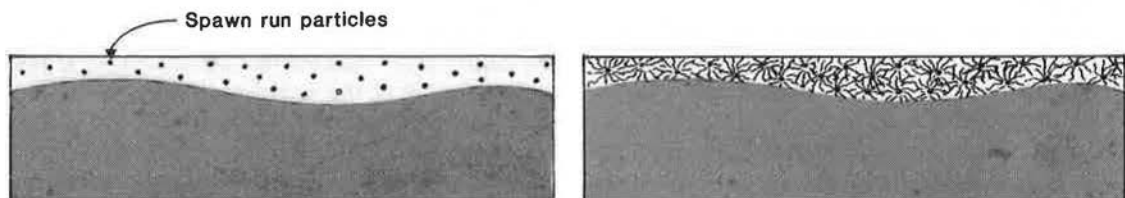


Fig. 2. Equalizing mycelium growth in the casing by 'spawn casing': (left) after casing is applied; (right) before fruiting.

unproductive patches on the bed. The compost to be used should be shredded to avoid the addition of lumps of compost. The shredding is usually carried out by hand with some care being taken to tease out lumps and to shorten long straws. Such lumps and long straws cause the mycelium to develop in an unsightly fashion on the beds.

The normal casing mixing routines can be used to incorporate spawn-run compost into the rest of the mixture. Even if peat is being wetted and mixed directly prior to casing, spawn-run compost can be added at this stage. A good mixing routine is required to ensure an even spread of the compost in the mixture. When the casing is applied to beds, strands of compost should be visible on, but not dominating, the casing surface.

Bringing in the 'spawn cased' crop

Most of the experience with the 'spawned casing' technique has been with casing materials based on sphagnum peat. More decomposed peats have been successfully tried, however, and it is likely that the procedures for all peat-based casing media are approximately the same.

The 'spawned casing mix' should be applied to the beds as wet as possible. If this is not done, additional water to bring the casing up to field capacity should be added soon after casing. In this way the knocking back effect of frequent waterings on the growing mycelium can be avoided. Normal temperatures and high humidity should be maintained as the mycelium grows through the casing. Only light waterings will be necessary and these only to replace moisture lost by evaporation.

Seven or eight days after casing a few patches of fully run casing will be followed within twenty-four hours by the appearance of mycelium at the surface throughout the crop (Fig. 3). A light watering at this stage will consolidate the mycelium at the surface. As soon as fluffing of the mycelium recommences, approximately one half day later, initiation of the crop is induced by maintaining air temperature below 18–20°C and reducing CO₂ levels below 600–700 p.p.m. through the introduction of fresh air. A lowering of the relative humidity to 85% R.H. will encourage evaporation at the bed surface and thereby cool the bed surface where initiation occurs.

The crop from then on is treated as a well-initiated traditionally cased crop would be. Water

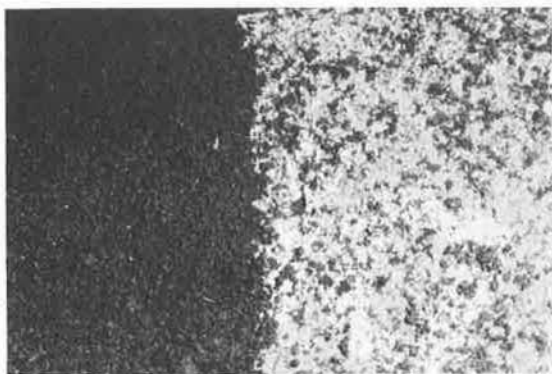


Fig. 3. *The effect of casing technique on the same tray: (left) plain cased half; (right) spawn cased half.*

is applied heavily when the initials of the first flush have reached pea size. Temperature and humidity are maintained as normal also. Because of the occurrence of mushrooms singly rather than in clumps it may be possible to apply water up to twenty-four hours before harvesting commences without risk of bacterial blotch.

The complete penetration of the casing layer achieved by the mycelium when 'spawned casing' is used can sometimes lead to excessive uprooting of peat when harvesting if the casing is dry. This will not be a problem if the casing is kept wet.

The normal use of insecticides, fungicides and disinfectants should not be affected when 'spawned casing' is used except in cases where their application depends on the absence of mycelium in the casing, e.g. formalin treatment at casing time. Where a chemical such as neat formalin is added to the casing as a pre-cropping disinfectant it is likely that the mycelium on the compost particles will be killed or at least checked. Likewise some fungicides are best applied well before mycelium appears on the surface of the beds and consequently their application date must be brought back a little.

Disease risks

The necessity for care in selecting disease-free spawn-run compost for mixing arises mainly from the potential the method has for spreading disease. If infected compost is used, the infection will be spread to the areas inoculated with it. This has been demonstrated in experiments with Mummy Disease (5). Infection as early as casing

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time will have more severe consequences than later infection.

It has recently been claimed (6) that *Pseudomonas tolaasii*, the organism causing Bacterial Blotch, is found in the compost. Blotch occurrence could, therefore, be favoured by adding spawn-run compost to the casing. In practice spawned cased crops have shown no extra susceptibility to blotch. The presence of *P. tolaasii* in composts is also disputed by other researchers (7, 8).

The disease risk involved in the use of 'spawned casing' should, however, be considered in the context of the other sources of infection on a mushroom farm. If the commonsense precautions previously outlined are adhered to, the use of the technique should be well within the risk limits normally tolerated.

Conclusion

'Spawned casing' offers the possibility to mushroom growers of achieving even flushing of individually occurring mushrooms developing on the surface of the beds. Better quality, easier and quicker picking, earlier cropping and easier management are the main benefits of the technique.

The most important factor to be kept in mind when using 'spawned casing' is to ensure that diseased compost is not added to the casing. Otherwise the technique is a simple one easily applied by the grower.

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Surface Structure of Agaricus bisporus by Scanning Electron Microscopy

by P. T. Atkey and R. Nichols

GCRI, Worthing Road, Littlehampton, W. Sussex

For some years we have been interested in the quality of harvested mushrooms. One aspect, familiar to growers, is browning of the pileus (cap) and stalk of white strains, associated with natural ageing and/or handling. In general, mushrooms kept at ambient temperatures, without protection from desiccation, will wrinkle and turn brown within a few days; the process of water loss starts at harvest and the visible symptoms of browning appear shortly afterwards. It is evident that the browning is hastened by touching the mushrooms, which is inevitable when the mushroom is cut, graded and packaged. The mushroom can brown while it is growing on the bed but the coloration can be made worse by post-harvest practices.

The browning of mushrooms is the result of an enzyme ortho-diphenol-oxidoreductase, sometimes referred to as tyrosinase, mixing with the phenolic substrates in cells in the presence of oxygen. In a fresh mushroom, enzyme and substrates are kept apart by cell membranes. If the membranes disrupt, brown compounds form from the products of the enzyme/substrate interaction, giving rise to the typical browning symptoms. Since the quality of the mushroom is a reflection of the amount of such compounds present, the factors which activate the enzyme are of considerable interest. One of these is the organization and anatomy of the cells (hyphae) which form the structure of the mushroom. Thus we sought a method to examine the anatomy of the hyphae in the cap so that the effects of ageing, storage, handling, and disease could be observed with a minimum of distortion. This paper is concerned with damage caused by handling.

In fact a considerable amount of information is available from studies with light microscopy. Preparation of tissues for this technique involves a sequence of fixation, dehydration, embedding and section cutting to obtain sections thin enough to reveal sufficient detail. These operations can lead to disruption of the delicate tissue of the mushroom surface which would probably mask the features which were of particular interest. Simple observation by eye suggests that the browning reaction is confined to the surface or close to the surface of the mushroom at least in the first instance. Although much relevant information about the anatomy of the mushroom has been obtained by light microscopy, the advent of the scanning electron microscope (SEM) has given the opportunity to examine the surfaces of materials at magnifications and resolutions greater than those feasible with the light microscope. The difficulty with preparation of tissues as fragile as the mushroom surface has precluded general use of the SEM for this purpose, but the method described in detail by Atkey (1983) is a significant improvement and very suitable for this type of study. It involves freezing the fresh specimen to approximately -145°C very rapidly and coating it with gold to make it electron conductive. It is then transferred under vacuum to the freezing stage of the SEM where it is kept at a very low temperature during examination. The advantage of rapid freezing is that the fluid in the mushroom cells freezes so quickly that there is no time for large disruptive ice crystals to form. The cells are thus revealed with little change and can be studied at length without deterioration. There is the further

advantage, invaluable in this study, that the specimen surface is untouched by hand or solutions during preparation.

Surface structure of the fresh mushroom cap

To observe the surface of a freshly picked mushroom, a small closed cup (Darlington 649, about 4 to 5 cm diameter) was cut from a first flush crop growing at 15°C and 91% rh in GCRI Formula 2 compost. By handling the mushroom at the stalk it was possible to avoid touching the cap at any time prior to examination in the SEM. In the laboratory a thin sliver of the cap was undercut, avoiding any contact with the exposed surface. The segment of cap was mounted on an SEM specimen stub and prepared as described above. The whole process from harvest to photography in the SEM took less than half an hour and the electron micrograph is shown in Fig. 1. It is evident that in the undamaged fresh mushroom, the cap is a network of loosely interwoven hyphae with substantial air spaces between them. The turgid appearance of the hyphae with little distortion suggests that the SEM preparation does not introduce serious artefacts. In some areas of the cap crystalline structures (not seen in Fig. 1) and tips of hyphae could be seen growing into the interhyphal areas. Occasionally a few *A. bisporus* spores, presumably airborne from elsewhere, were seen adhering to hyphae.

Surface structure of the damaged cap

To find out what happened after handling the cap, an area opposite to that studied earlier was

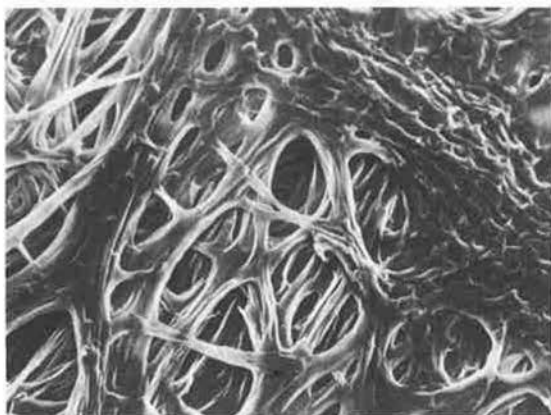


Fig. 2. Opposite side of mushroom shown in Fig. 1, 45 minutes after handling, showing damaged hyphae and coalescing cell contents

deliberately rubbed to simulate more normal handling. Within minutes the surface was pink and when it was sampled for the SEM, about 45 minutes later, the pink area had turned brown in patches. The electron micrograph (Fig. 2) shows that in places the surface hyphae had coalesced, exuding cell contents which initiate the enzyme/substrate reaction referred to earlier. Ends of broken hyphae could be seen clearly. The hyphal damage was confined largely to the surface and intact hyphae could be seen below the coalesced hyphal strands; the cell contents of the latter contribute to the stickiness of a damaged or abraded mushroom cap.

We feel that this SEM technique offers considerable promise in understanding the degenerative processes occurring after harvest, since it is possible to visualize the structure with the minimum of distortion. This could be useful for observing effects of prolonged storage on quality, the influence of changed gaseous environments in an overwrapped prepack on development of the mushrooms, the effects of 'washing' on structure and colour, and changes in structure caused by environment during growth. It could also be useful for comparing the differences in behaviour of strains of *A. bisporus* with those of other species of *Agaricus* with regard to post-harvest development.

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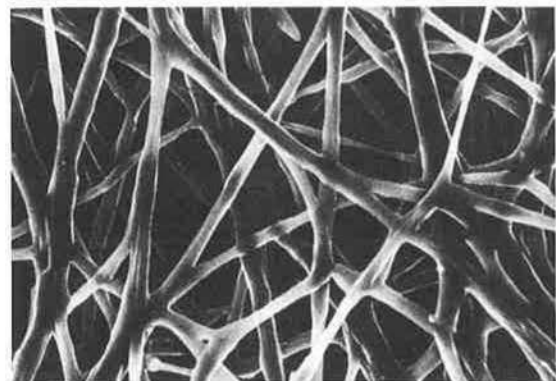


Fig. 1. Fresh untouched showing intact hyphae

A New Fungicide for Mushrooms

by J. T. Fletcher

ADAS Wye

During the past 20 years only 5 different fungicides have been recommended for use on the mushroom crop and at present there are only 4 completely different ones (a number of products are either the same or very similar) available for mushroom growers to spray on to diseased crops. The advent of a new fungicide is therefore, unusual and of considerable interest. In April 1981, we reported in the *Mushroom Journal* the results of ADAS experiments with various fungicides and in particular with prochloraz-manganese, a fungicide manufactured by FBC Limited of Chesterford Park, Cambridge. In the article we reviewed the search started in 1976 for a new fungicide which would control benomyl resistant strains of *Verticillium fungicola*, the cause of dry bubble disease. The results obtained with prochloraz-manganese were very encouraging because not only did it give a good control of *Verticillium*, it also controlled *Mycogone* and *Dactylium* with no marked phytotoxicity. Recent publications from GCRI and from Holland show very similar results with this product.

Why then is prochloraz-manganese not available to the British mushroom grower? Especially as it is now being sold in the Netherlands as Sporgon. By way of an explanation some background information on the introduction of new products to the UK market may be useful. There is a set procedure to observe in order to get a label recommendation for a fungicide in the UK. Firstly, it must be shown to be safe to use, presenting no hazard to the operator and leaving no dangerous residues for the consumer of the treated crops. In order to overcome this hurdle, residue data must be presented for consideration under the Pesticide Safety Precautions Scheme. Toxicological data derived from feeding studies must be available in order to determine safe levels of residues for human consumption. Having satisfied these preliminary conditions, clearance can be given for the use of the fungicide in very

small scale experiments (Trials Clearance) where the treated crop may have to be destroyed. More data is usually required from larger scale field trials in order to obtain Limited Commercial Clearance or, ultimately, Provisional Commercial Clearance or full scale Commercial Clearance.

When the appropriate biological data is also provided and the product shown to be effective for its claimed use, it can be entered for Approval under the voluntary Agricultural Chemicals Approval Scheme. Such Approved products have the capital 'A' sign on their labels.

Where has prochloraz-manganese got along this line? Toxicological and residue data are available and have been considered under the Pesticides Safety Precautions Scheme and Provisional Clearance has been granted for the use of prochloraz-manganese on mushrooms. This clearance covers 3 different approaches to the use of the product which is a 50% wettable powder:

1. 30 g of product in 10 l to 10m² applied between 1 and 10 days after casing. With this method of application there is a 10-day harvest interval, i.e. mushrooms must not be marketed within 10 days of making the application.
2. 12 g of product in 10 l per 10m² applied, firstly between 1 and 10 days after casing and secondly after the first flush. With this rate of application there is a 2-day harvest interval.
3. 6 g of product in 10 l per 10m² applied 1 to 10 days after casing and twice again after subsequent flushes, i.e. after the first and again after the second flush or after the second and after the third flush etc. There is a 2-day harvest interval with this rate of application.

FBC Limited hope that the product will be available for the industry in the UK to use very shortly.

The indications from all the results so far published are that prochloraz-manganese is a very

useful addition to the mushroom growers armoury. Since the widespread use and ultimate failure of Benlate and related fungicides, mushroom growers have become very aware that it is foolish to rely on any fungicide, however effective for disease control. There is no substitute for hygiene and for the past few years the industry has had to rely almost solely on hygiene for the control of *Verticillium*. Whether resistance to prochloraz-manganese will develop should this fungicide

become widely used is a matter for speculation. Experience with similar fungicides in the same group suggests that the risks of resistance are low and are only increased with intensive use, i.e. many applications to one crop. It is therefore likely that this product will remain effective when used according to the manufacturer's instructions but it is also to be hoped that growers will not once again abandon their principles of hygiene which are now so well established.

YOUNG MUSHROOM GROWERS . . .

Timothy Cripps

At the age of 18 years Timothy Cripps, son of Sidney Cripps of Pond Chase Nursery, Hockley, Essex, has been working on his father's mushroom farms for two years, preferring to leave Thorpe Hall School at the age of sixteen, in order to begin working and to gain experience rather than continue his schooling. That having been said, he is in no doubt about the value of education and training — he attends a day release course at Writtle Agricultural College and is quite enthusiastic about the value of the Agricultural Training Board of which he has first-hand experience. He has been on the Dutch Course.

The Cripps family, father, mother, two daughters and Timothy, live at Blounts Farm, Hockley, surrounded by an agricultural holding of 140 acres to which Sidney Cripps has plans to add further land. Blounts Farm is less than a mile away from the mushroom plant.

Timothy, studying mechanics and general agriculture on his day release course at Writtle, devotes his working life between the mushroom plant and the agricultural undertaking, and is keen on the MGA, attending what MGA meetings he can. He believes particularly in the value of farm walks, for, as he says, 'You never know what you might pick up.' This is not a surprising observation in view of the fact that his father, on a trip abroad, picked on an idea which has resulted in a particularly successful innovation at his mushroom plant — but more about this in a separate article.

Of the MGA in particular and the UK mushroom industry in general, Timothy has this to say: 'I think the MGA gets it's balance about right

as far as meetings go but I think, as far as the industry in general is concerned, it doesn't really seem to appreciate the need for more and more publicity and the value of presenting mushrooms in the best possible way. I think growers would do well to follow their mushrooms from the farm through to the markets and even to the retailers, so that they see just exactly how they look when offered for sale to the housewife.'

As a committee member of the Essex Young Farmers, Timothy is a great supporter of that organization. He has lately taken up shooting as a hobby but his first love is motor-cycling and motor cross. At motor-cross — the description applied to cross country motor-cycling — Timothy, having followed the sport since he was eleven years old, at the age of 16 became 4th British Senior (School-boy) Champion. He gave up a promising future in this sport mainly because of injuries which he sustained.

WRA



Timothy Cripps



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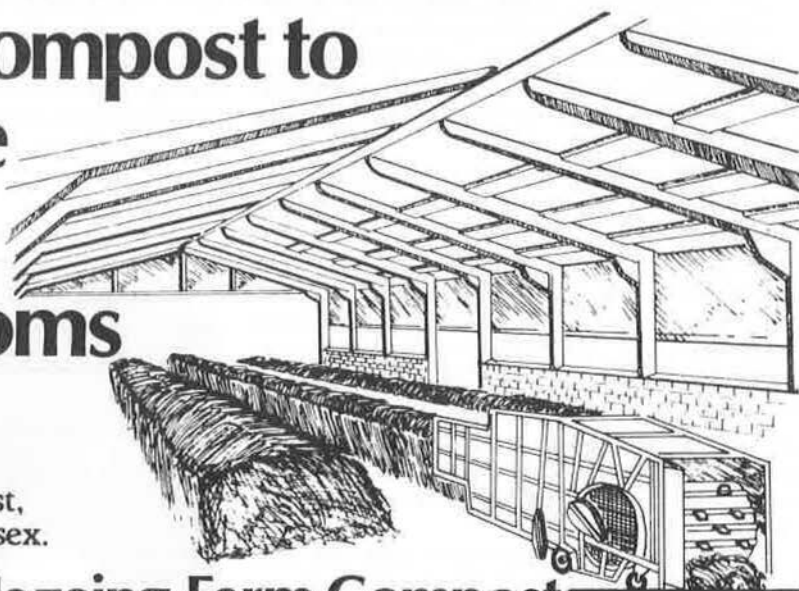
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THE BUSH TELEGRAPH

SEPTEMBER 1983

... Food from Britain's emphasis on the home market will be on existing opportunities for gaining market share in fresh and lightly processed foods, says Nicholas Saphir, Chairman of Food from Britain. The application of rigorous quality standards for domestic produce and building up a catalogue of 'quality approved' British produce will eventually lead to joint promotions.

In overseas markets it has been agreed by both Food from Britain and the British Food Export Council that BFEC will become the export arm of the new organization.

In early July the selected priorities and market sectors will be presented to the Food from Britain Council for their agreement. And by September, the full programme will be finalized and ready for action.

One priority will be a detailed survey among the major UK retailers to establish a list of products which they currently import, despite the availability of domestic equivalents together with the reasons for their decisions. Mushrooms will doubtless fall into this category.

... William Lord of Leeds is one of Britain's brightest workplaces. The Permoglaze Safety Education Trust, a committee of the British Safety Council, announced the result of the nationwide 'Britain's Brightest Workplace Competition' aimed at finding the Company with the most sensible and creative attitude to using colour at work.

From hundreds of entrants a short list of Companies was visited and Lord's came a very respectable second. William Lord Ltd is a highly successful mushroom grower. Overall winners Racal-BCC assemble sophisticated radio equipment for the armed forces. And Carrs Printers of Lancs. is a family firm working from an old mill.

William Lord was highly commended for its creative use of colour, pleasant working environment and prominent use of safety signs and colours. Each of these factors help reduce industrial accidents and increase productivity.

... Dr Keith Dexter, Director General of ADAS and a very good friend of the mushroom industry,

has been appointed Second Crown Estate Commissioner as from 1st September 1983. At this time no successor has been appointed.

... *Verticillium* is one of the world's worst crop diseases and causes over \$1,000 million in annual damage to cotton and over \$50 million to potatoes in the United States.

A Beltsville (Maryland) Agricultural Research Centre Plant Pathologist, James J. Marois, is testing the fungus *Talaromyces flavus*, as a biological control agent against *Verticillium* of cotton, potatoes and alfalfa.

Marios and his colleagues originally tested *T. flavus* against *Verticillium* of eggplants and discovered that plants treated with *T. flavus* developed at least 75% less *Verticillium* than untreated plants and also produced a higher yield.

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According to Marios, the discovery of *T. flavus* as an aggressive enemy of *Verticillium* is a result of soil ecology studies. In greenhouse tests, he screened thirty-four species of fungi as likely biocontrol candidates and tested these fungi on greenhouse eggplant seedlings. Soil in the pots was inoculated with water-suspended test organisms. Six species proved to inhibit *Verticillium* significantly. He transplanted eggplant seedlings into *Verticillium*-infested fields and of the six species, only *T. flavus* inhibited *Verticillium*.

Wonder if there'll be a spin-off for mushrooms?

Peter Wayne Middlebrook

An appreciation of Peter Middlebrook from a member

To many people in organizations with which the MGA is concerned the name of Peter Middlebrook would be almost synonymous with the Mushroom Growers' Association and what they represent.

Yet inside the MGA itself and in the mushroom world elsewhere, he was, despite being totally involved in the Association's affairs, relatively little known both for his work and as a man. He was not a great traveller, nor one for the junketing.

A tireless and courageous worker and supporter, he was also one of the Association's most trenchant scourges. This was the nature of the man: that which he most valued he sought to perfect and this meant testing, questioning, even

attacking so that nothing inferior or slipshod was accepted.

No doubt his family and his firm would testify to this restless striving which was so much a part of the Peter we knew.

An explicit honesty shone through all he undertook. All his commitments were set against a basis of his own philosophy and logic before being entered into — once settled they stood rock solid.

Many an office holder in an Association who might have feared his critical appraisal or refreshingly blunt manner will have ended his term grateful in the extreme to the unstinting support given.

His work as Chairman, on the Manpower and Economics Committee and on the Editorial Board of the *Journal*, was outstanding over many years. Few men in or out of formal office in the MGA have given so much and we should be grateful that, though his presence is now lost to us, his influence will live on.

Conference Hotel Rates

The rates for the Brighton Conference at the Bedford Hotel are as printed in the July *Journal* on page 239.

Sharing a twin room per person £34.50 per day.

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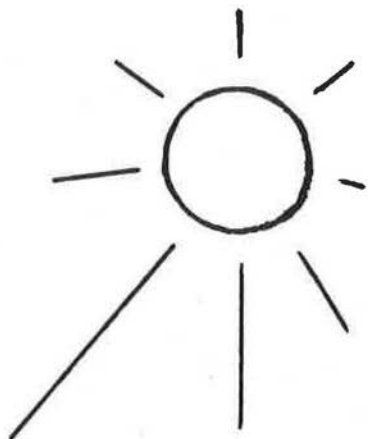
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