usage, geese need cause no damage to young grass in early autumn.

It is a pleasure to thank the staff of the Rosemaund Experimental Husbandry Farm at Preston Wynne, Hereford, for their assistance in the running of this trial.

* 5 lb. 2 23 Ryegrass (perennial)
5 lb. S 24 „ „
5 lb. S 101 „ „
4 lb. S 48 Timothy
4 lb. S 215 Meadow Fescue
2 lb. S 123 Red Clover
1 lb. S 100 White Clover

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The reaction of captive Mallard to grain treated with a commercial bird repellent

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Wildfowl predation presents a very minor problem to agriculture as a whole in Britain, and only at certain times and in certain places does it become necessary to limit their activities (Kear, 1963). It is recognised that the application of a substance to a crop which will render it unattractive but not kill would be very advantageous, but the study of chemical protection against birds is still in its early stages. A variety of substances relying on the sense of taste, smell, touch or pain has been tried unsuccessfully with ducks in America (Neff and Meanley, 1956); whole barely soaked in gum turpentine and in kerosene was completely eaten and the commercial American repellent Pestex, dusted on to the grain, did not even slow down the birds' feeding rate. However, Neff and Meanley (1957) and Neff, Meanley and Brunton (1957) claimed consistent success against grackles, cowbirds, redwings and other birds when anthraquinone was used at heavy levels. Later, Duncan (1963) reported the reactions of feral pigeons to seven active ingredients of commercial repellents in solution. All solutions, with the exception of anthraquinone, produced a significant reduction of fluid intake and β-naphthol was markedly rejected. Duncan pointed out that, although insoluble anthraquinone showed no repellent action when tested in this way, this does not mean that it is valueless when used as a powder. Anthraquinone (a harmless, yellow crystalline ketone, $C_6H_4(CO)_2C_6H_4$) is in fact a basic ingredient of a German-made bird repellent marketed in Britain as Morkit. At the Wildfowl Trust, a few preliminary tests have been made in which four caged hand-reared Mallard were offered grain treated with Morkit.

Methods

Wheat grain was selected for testing because it is known to be preferred to other cereals by both tame and wild-caught Mallard over short periods (Kear, unpublished data). The birds were kept in pairs (a male and a female together) in separate cages and fed on a mixed diet of wheat, rusks and commercial poultry crumbs, with water and grit always available. In their daily test regime, the ducks had a dish of mixed food over night and for part of the day, but for six daylight hours they were offered only wheat grain. For a preliminary period, this grain was untreated, and for the following two weeks the birds had a choice of treated and untreated grain from two similar containers, the position of which was altered at random. For the next two weeks they were offered only treated grain in both dishes and during the final fortnight they returned to the choice situation. The treated sample was prepared by mixing 10 kilos of wheat with 1 pint of Morkit 'solution', made up as directed on the packet (about 1·7 gms dry weight of Morkit to 10 kilos of wheat). This amount of liquid effectively wetted the surface of each grain, which was subsequently dried in warm air. The control wheat sample was moistened with one pint of tap water per ten kilos and also dried.

Results

During the first two weeks of the test the ducks consumed on average 15·7 gms per bird per trial period, and of this only 25·2 per cent during the first week and 23·6 per cent during the second week was of the treated wheat grain. During the third and fourth weeks, when only treated grain was available, the birds reduced their intake and consumed on average 5·9 gms and 4·6

gms respectively per bird per trial period. In the last two weeks the Mallard took on average 13·3 gms per bird per test period, and 7·9 per cent during the fifth week and only 3·1 per cent during the sixth week was of the grain treated with Morkit.

Discussion

It appears from these few experiments that Morkit, even at low concentrations, will repel ducks that are not particularly hungry. What it is that the birds dislike about anthraquinone is uncertain. To humans it is tasteless, though producing a rather odd sensation in the mouth as an after effect. It must be pointed out that caged birds normally prefer uncontaminated food with which they are familiar whatever the contaminant (Neff *et al.*, 1957), and a true repellent must satisfy two paramount requirements: it must repel even hungry birds, while not being toxic to plants nor harmful to structures (Duncan, Wright and Ridpath, 1960). With wildfowl, however, the problem is often not to remove the birds altogether but to persuade them to feed in places where the damage they can do is negligible. Subsequent, more important trials will assess the value of anthraquinone when sprayed on to selected areas of grass in an effort to control the grazing of geese and swans.

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Wader ringing by the Wildfowl Trust, 1959-64

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In August 1959, the Wildfowl Trust's rocket-netting equipment was successfully used to catch waders on the south shore of the Wash. The initiative for this operation came from Dr. C. D. T. Minton and other ringers under the collective name of the Wash Wader Ringing Group. Although the rocket-nets were designed for catching geese and had, apart from occasional sorties after ducks, been used exclusively for this purpose, the equipment required no modification in kind for wader-netting. The greatest single obstacle to catching waders with nets thrown over them, as opposed to flight-netting, is finding suitably hard ground, frequented by the birds and preferably not ever covered by the tide, on which to place the nets. The topography of the Wash with its areas of salting and mud in front of the sea-wall and large fields behind provided the answer. During normal high tides the waders are driven off the mud-flats, over which they feed, on to the saltings. Here they roost until the water has receded. During periods of spring tides, however, the saltings are generally completely covered and the birds then fly over the sea-wall and roost in large, compact flocks on suitable fields, usually choosing ploughed land or fields with very short vegetation. It was this habit that was first observed and then taken advantage of by the Wash Wader Ringing Group using the rocket-nets. The catching was all done in daylight, the tides sometimes giving us two chances in a day, more often just one.

In each of the five years 1959–1963 catching operations were carried out for one or two periods of a week, between July and September. At this time of year relatively few suitable fields were available as roosting sites, making the choice of where to set the nets a little less difficult. The technique improved with experience but a number of important discoveries were made early on. Unlike geese, many waders do not lie quietly when caught by the net and it was necessary to cover every bird with blackout material immediately after firing the nets. This done, the birds were extracted and placed in the hessian keeping cages. Here they sat quietly until ringed and released. It was learnt very soon that two rocket-nets of ¼ acre each cover very little of a field which may be up to 110 acres in area. However if, as not infre-