Gardeners and Herbicides

Gardeners who imagined a pest-free space where their vegetables, fruits and decorative plants could flourish without competition from weeds and insects have long been able to turn to chemicals and branded chemical products. Gardeners were able to use chemicals at their disposal in the household that when either sprinkled onto or applied by spiking with a skewer were capable of killing weeds, which included common salt, carbolic acid, sulphuric acid. As we have already seen, acids including carbolic and sulphuric became more difficult to get when they were included on the Poisons List. The number of chemicals and preparations, which were not on the Poisons List and that were marketed to amateur gardeners to help them look after their garden expanded rapidly between the 1930s and the 1980s. Tool-sheds of chemical-minded gardeners were described as looking like laboratories with their rows of bottles, tins, powders and liquids.[[1]](#footnote-2) By the late 1970s there were over 200 branded chemical preparations available for amateur use in the domestic garden, along with their own consumer-focussed regulatory system, implemented by MAFF.

Although annual expenditure by British gardeners perhaps suggests that weeds are of less concern to garden chemical users than insect or fungal pests,[[2]](#footnote-3) I have chosen to look at herbicides in this chapter. While there are certainly fascinating stories to be told about the control of insects and fungi using chemicals, concentrating on the practices of weeding, characterised as back-breaking and tedious, allows me to consider the concept of labour and therefore tie in more closely with the thesis' other chapters on household chemicals and photographic home processing. Herbicides are also explicitly implicated in more acute poisonings than other pesticides are, so are a real source of immediate hazard to the user and others who share the garden, such as children, pets and wildlife, which may be considered in any decision to use any kind of pesticide. Gardeners must consider the future, how the want to use the space occupied by the weed, and the residue left on treated fruits or vegetables. Advertisements or warnings associated with these other pesticides may be included for reference, context or comparison, but the focus of this chapter remains on herbicides. My choices of chemicals for case studies, sodium chlorate and paraquat, have properties that make them the most suitable choice for one of three different weeding scenarios commonly encountered by amateur gardeners: paths and cultivated beds. This detailed examination of the uses of herbicides in British homes encompasses stories about the social history of gardening.

Not only are they used for different purposes, these two chemicals allow comparison between entering the market at different periods of time, where sodium chlorate arrived on the market in the 1930s and paraquat in the 1960s respectively. Both chemicals were initially used agriculturally, before being available to domestic users, complexity was added to the story of paraquat by the provision of a specially formulated version for home gardeners. Sodium chlorate was embraced for its long term suppression of weeds and was always referred to by its chemical name whether or not it was also associated with a brand. Paraquat "starred" as the active ingredient in branded products from a very limited number of manufacturers (but all subsidiaries of a single company), and the chemical name paraquat dominated discussions of the products, rather than its brand names. Misuse of sodium chlorate and paraquat led to both these chemicals facing restrictions on sale, before further concerns about safety led to total bans, which occurred outside the scope of this study.

sodium chlorate 1934 - - - - – - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - -2009

paraquat 1965 - - - - - - - - - - - - - - - - - - - - - - - - - - - 2007

Figure (needs work) to try to show that the weedkillers were introduced to amateur gardeners at different times, but in later part of the time frame of this thesis users were able to choose between all three, depending on their needs.

The increased availability of chemical aids to gardening must be considered in the context of who worked in the home, and of how leisure was pursued at home, as well as the capability of the chemistry industry to provide new chemicals and convince people of their utilities. When these factors are taken into account, as this chapter aims to do, we can start to understand the position of the chemical user as an active, decision-making agent operating amongst social factors including changes in availability, affordability or acceptance of chemicals, of buying-in garden care services, life cycle or recreational approaches to garden care duties. The use of gardens between the 1930s and the 1980s changed, increasingly becoming designed and used as outdoor rooms, with patios for alfresco dining, safe places for children and pets to play and for families to relax in an easy to maintain, aesthetically pleasing space. Yet gardens have remained functional, as a place to grow food for the family, a place to dry the washing. Gardens might incorporate paths that served to avoid tracking mud into the house when visiting washing lines or sheds, and so needed to be kept free of weeds and slimy, slippery algae. Even as more homes acquired automatic laundry dryers, clothes lines were not abandoned and in appropriate weather laundry was hung out in gardens, though perhaps on more technologically advanced carousels or using synthetic lines and pegs. Plants could be seen as a nuisance not only in the form of weeds, aesthetically displeasing plants out of place or competing with desired plants, but also a threat to neatly laid paving of parking areas or patios, to building foundations or structural walls by upheaval of roots or prying tendrils. Weeding is bound up in ideas of control and power over one's domain, with weeds and other pests portrayed as enemies to be constantly battled into submission through sustained labour and chemical applications. In this way, the supposed peace and security of a domestic garden is transformed into the site of outright violence against weeds.

This chemical violence has been better examined from an American perspective because of local weed ordinances which focus on species that simply aren't present in the UK, so the volume of herbicides and the anxiety and resistance they provoked inspired environmental histories to be researched. This provides comparative material to researchers who want to study domestic garden practices in Britain, although the literature review demonstrated that the historiography concerning the use of garden chemicals in Britain is distinctly lacking. There are plenty of practical gardening books, magazines and newspaper columns that can help shed light on the use of garden chemicals between the 1930s and the 1980s. The choice of sources, as ever, can change the conclusions drawn. For instance, Jane Fearnley-Whittingstall asserted that chemical weed killers did not exist before 1939 based on her analysis of a gardener's note book and the newspaper clippings contained within.[[3]](#footnote-4) This statement hinges on how a chemical weedkiller is defined or understood. Even if we understand chemical weedkillers to be specialised for use in the garden, such as "daisy destroyer", these too have been available before the 1930s.[[4]](#footnote-5) Fearnley-Whittingstall was led to this generalised statement by her view of the power of weedkillers readily available to domestic gardeners at the end of the 20th century, which eclipsed the chemicals employed in the garden in the 1930s, as well as the compilation of the gardening notebook she studied.

Some weedkiller adverts in the 1930s framed hand weeding as expensive, which introduces tangled ideas of who might be doing this work, and how weeding was approached. At first glance it indicates that in some gardens people were being paid to do the time consuming, repetitive and therefore costly task. (need photo of that advert, didn't have camera with me that day) While the practices of employing hired help inside the house has been examined by scholars, gardening (in homes other than stately) has not received the same attention, possibly because it was often carried out by the householders themselves. Historian Steven Constantine's view of middle-class gardening was that magazines for amateurs promoted gardening as a predominantly do-it-yourself activity from the 1850s, and that gardening was taken up as a gently active, restorative past-time.[[5]](#footnote-6) Even operating garden equipment used to spray insecticides could be pleasurable, as demonstrated by this statement: "What can be more tonal than the satisfaction which the grown up amateur or master of the house, enjoys when he returns from the city to his garden in the summer evenings, and applies the syringe to his wall trees, with refreshing enjoyment to himself and the plants and to the delight of his children who may be watching his operations."[[6]](#footnote-7) Although the author of this scene did not mention what was contained within the sprayer, it could have simply been water to refresh the leaves in an industrially polluted area, the possibility of fascinating picture of domestic chemical use in 1838 as entertainment, not just care of plants, has been conjured up.

## A gendered activity?

This reference to the master of the household points to gendered division of labour. He was expected to manage the fruit trees, vegetables and lawn, while the light work of tending flowers and weeding were allocated to women and children of the household.[[7]](#footnote-8) However, in addition to the manipulation of heavy machinery, weeds were identified and eradicated. That this was undertaken by men is hinted at by the description of how "brain workers" would find the sense of achievement that could be gained from seeing the immediate visual impact of a session of weeding particularly beneficial, and the process of identifying weeds was even characterised as a stimulating, interesting activity.[[8]](#footnote-9) These "brain workers" who were presumably involved in office based, long term projects and denied the satisfaction of a tangible result as part of their regular employment.

The ways that weeding could be approached was also described in gendered terms, which could be linked to the experience of work in the home and paid employment elsewhere. The concept that weeding was a task to be done in "odd moments" was one that garden writer Marion Cran espoused, and this meant that it could be regarded as costing nothing. I argue that this reflects women's experience of fragmented nature of domestic work which involves waiting for processes and people. Weeding undertaken by men on the other hand was something that had to be approached stoically and for extended periods of time, and this relates to the single minded focus that men are expected to exhibit in their paid work. The concept of hand weeding as expensive depends on how the person doing the weeding values their time. An unpaid housewife may appreciate the opportunity to spend a productive "odd moment" in the garden, choosing if she prefers, or if circumstances allow, to do a longer stint, whereas for a man used to approaching tasks for prolonged periods of time, applied to weeding this became a tedious chore, plus he knew the monetary value of his time. The readership of magazines such as Amateur gardener, from where the example of weedkiller advertising was taken, was middle class gardeners who generally did for themselves. Perhaps the word "expensive" in this context was used ambiguously and could be read as simply time spent, or cash paid out to an employed gardener, which would worked to make the sentiment, and the product, relevant to both DIYers and employers of gardening staff.

While garden tasks requiring physical work with dedicated tools, heavy machines and chemicals might suggest the garden as a masculine space, this is would imply that the physicality, machines and chemicals required for housework would attract men to the task. Nonetheless, in garden manuals the sense of a male gardener is carried beyond the casual use of pronouns, and the desire for standardisation of measurements and aids for accuracy could hint at a masculine gardening task force, especially when compared to the more vague domestic measurements employed in handling chemicals used by women in laundering and general housework. We saw in the earlier chapter that women were dealing with "little lumps" of chemicals that may or may not have a comparable size to a roughly standard item such as a walnut.

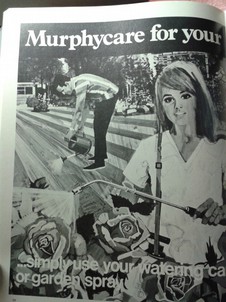
While gardening books and manuals described masculine workers, in garden chemical adverts both men and women were featured but for different tasks. Women were not depicted as weeders, despite a history of low-paid work in this role. Adverts depicted men doing the lawn care and weeding, but this is not to say that women's use of chemicals was feminised or that they were not involved in the same battle against the ravages of garden pests. When adverts for other garden products are considered, female users signal the items' lightness, or simplicity of use. This can be seen most strongly in lawn mower adverts, but also in those for sprayers and chemical sprays. The appearance of women spraying the garden with chemicals means that they were chemical users, and they were killers of mites, aphids and fungi, but not of weeds. This division of labour occurs from the 1960s so coincides not just with the increasingly visible movement for gender equality, but also heightened awareness of the health effects of chemicals, especially on reproductively active women. In this respect, the female users can stand in for chemical safety but when lawn care chemicals are benign, women are not needed to denote safety.

Magazines modelled a more equal division of labour, at least from the mid 1960s, and showed women involved in lawn care and weeding, measuring out chemicals into a watering can and operating a flame gun. In the following six images showing a person waging war on weeds, rather than just the tools involved, four showed men.[[9]](#footnote-10) This montage featured a gardener wearing a floaty, feminine dress and coiffured hair making up a solution of lawn treatment which was then applied by a man.

Illustration 1: Photo montage from "War on Weeds" Practical Gardening, June 1963, p65

A photo sequence that appeared in 1981 showed an almost androgynous woman dressed for heavy gardening work, in warm, loose fitting clothes who was also the one who applies the solution she made up.[[10]](#footnote-11) Both sequences modelled the advised best practice of making up the solution outside, rather than in the kitchen or utility room. Protective gloves are not indicated as necessary here, and the cap was used as the measure in the 1981 photographs, removing the need to use spoons as appears to be shown in the 1963 image. The clothing is probably more to do with the time of year that the articles were produced for, March and June, although the comparatively smart dress of the 1963 lady gardener also implied the absence of heavy gardening work and that the use of chemicals negated any need to dress down for dirty gardening because using chemicals was clean and easy. Wearing dedicated gardening clothes in the 1980s signalled a change in attitude, their use suggested that garden chemicals should be prevented from contaminating everyday clothes and the domestic interior.

Advertising is only one way of getting a glimpse of the situation, but there is certainly a difference in how chemical products that reduced the amount of work in the house, compared to those for the garden, were portrayed. Household cleaning products in the 1930s were regularly portrayed as anthropomorphised servants under the influence of the housewife, while weedkiller advertising did not follow this trope. Although it is hard to say from the illustrated hands and feet that appeared in weedkiller adverts that they were not those of a hired gardener, where a more complete image of the product user appeared they appeared leisurely rather than busy. That chemicals were not generally taking the place of hired help supports Constantine's notion that generally gardening was done by the home dweller.

Illustration 2: "Murphycare for your garden, simply use your watering can or garden sprayer". This advert shows typically gendered division of labour.

Working in the garden is a past time that can be pursued alone, or as a joint project.[[11]](#footnote-12) An example of this can be seen in a 1970s advertisement for Murphy's range of garden chemicals, which shows who we assume to be a husband and wife working together. More often though, advertisements for garden chemicals often show a solitary chemical user, suggesting that garden users kept out of the way. This may be one of the reasons behind why garden chemicals, or at least their packaging, do not appear to have been collected with the same relish or desire for completeness, as packaging for food and other household products, even when more specialised collections such as those of the Garden Museum and the Museum of Brands are taken into account. Unlike goods experienced by the whole household, such as chocolates or washing detergents, garden chemicals tend to be used relatively scarcely, through well spaced applications rather than daily or weekly, and are only used by particular household members. As such, they would not be expected to elicit the same type of nostalgia as do food and laundry products. Perhaps their status as killers has meant that they are even more likely to be thrown away when no longer needed, or as attitudes to work in the garden change. Maybe their low profile in museums matches their profile in the home, items that were not prominently displayed but kept, as the instructions advised, out of reach in the shed.

The use of garden chemicals can be seen as engagement with the fruits of scientific endeavour and progressiveness. Leisurely, slow hand weeding was to be left behind as the pace of life increased, replaced by proven chemical methods.[[12]](#footnote-13) Available chemicals even shaped garden design, so that a less labour-intensive garden design incorporated easier herbicide application, such as taking into account how leaching could be contained.[[13]](#footnote-14) These everyday interactions demonstrate that garden chemicals users could make sophisticated decisions, calculating how leisure time could and should be spent, and while they were very much in control of the chemical, adaptations to garden design which bore in mind the concept of long term chemical use could quite profoundly shape a space.

## Buying garden chemicals

In order to use chemicals, they must first be obtained, and most commonly they must be bought from a store, though this is not always the case. Chemists shops could be the source of both unbranded chemicals, as well as prepackaged and therefore branded preparations. Hardware stores too catered for the gardener, and were able to advise on the use of and then sell chemicals for garden use. The rise of self service retail prioritised prepackaged goods in these shops as well as grocery stores, which reduced reliance on knowledgable sales staff. Despite the availability of some garden chemicals in general stores such as Woolworths, gardeners embraced an even more specialised opportunity to obtain resources for their hobby when garden centres took hold in Britain. This was a retailing system made possible in part by the ease that prepackaged chemicals could be displayed to shoppers and selected by them.

Garden chemicals were not sold in supermarkets, and this separation from the goods that women regularly chose on behalf of their families, meant that women were less likely to buy them and therefore to be directly featured in adverts for them.

Despite being perhaps at first glance, an excessively utilitarian choice, garden chemicals were considered by some as suitable for gifts,[[14]](#footnote-15) appreciated by the recipient because it meant not having to spend money on the product. Chemical manufacturers capitalised on this trend when they combined fertilisers with a watering can and marketed it as a gift set,[[15]](#footnote-16) rather than simply a convenient pairing, while another priced packs low enough for children to buy a present for their parent with their own pocket money.[[16]](#footnote-17) Soil test kits, a convenient and easy-to-use set which overcame the confusion of buying the correct hydrochloric acid concentration,[[17]](#footnote-18) were perhaps expensive enough to mean a gardener might hesitate to buy one for themselves, and made a very practical gift for a gardener.[[18]](#footnote-19)

As substances that were used up, garden chemicals as gifts can be considered to be in the same category as other consumables such as wine and food stuffs (rather than durable such as tools, books or decorative items). The gift set market is not one that readily springs to mind with regard to garden chemicals but it was obviously considered worth pursuing. The chemical gifts suggested tended to be for nurturing and improving, rather than killing: fungicides, herbicides and insecticides did not make the lists. Although garden chemicals might only have been given by small numbers of people, I wanted to highlight chemicals as gifts because manufacturers did and it shows that in some cases, not only were adult gardeners considered the target audience, but also their young offspring. Inculcating garden chemical buying practices at an early age was a clever move on the part of manufacturers, normalising chemical use and familiarising another generation of potential users.

## Regulation and Legislation

So far I have talked only about the ease with which garden chemicals could be obtained, but gardeners seeking to kill pests and weeds were affected by the Pharmacy and Poisons Act 1933, and the Poisons Rules, which we encountered earlier in the chapter on household chemicals. It exerted its influence on retailers, who had to be registered to sell products, then discern who could properly buy the poison and record their details if necessary, but as with household chemicals, the legislation also shaped the products that were sold, as manufacturers searched for products that could be sold as widely as possible.[[19]](#footnote-20)

Acids were mentioned earlier as a form of herbicide that became restricted through the Poisons List, but another type of chemical on this list were the arsenical compounds, which were still available to domestic gardeners into the 1980s. Their use was not recommended and other less poisonous products were on the market, for instance DDT replaced arsenical insecticides when it became publicly available in the 1940s. Those who wanted to use arsenic preparations such as Paris Green to kill pests were advised to seek out named brands of pastes, safer to handle than the powdered forms.[[20]](#footnote-21) However, arsenic based domestic products had not been embraced by users with particular gusto despite their effectiveness. The early implementation of maximum arsenic residue levels on agriculturally produced food crops which would have raised the profile of risks associated with domestic spraying.[[21]](#footnote-22) Additionally, their association with accidental or deliberate poisoning, made gardeners wary of using arsenic products widely. Indeed, poisoning with arsenical weedkiller was a staple of Agatha Christie novels,[[22]](#footnote-23) cementing this domestic use of chemicals into the popular imagination.

Even if it was not a frequent choice of domestic gardeners, arsenic was held up as the standard by which other weedkillers were judged, as we can see from an advertisement from 1934 for Sofnol which declared the product a "non-poisonous weedkiller as effective as arsenic yet absolutely safe". This shows that the absence of arsenic was a feature that some consumers sought out, and was therefore a selling point to be highlighted. However, the advertisement did not divulge what the active herbicidal chemical was.

Another couple of adverts from the 1930s, from chemical manufacturers Tomlinson and Hayward, provide a demonstration of how gardeners had to read between the lines when the active chemicals were not listed. The company offered two different weedkillers, adverts for which emphasised different qualities and no doubt appealed to users with different needs, but neither advert stated what in the weedkiller made it effective. Adverts for Luda pictured 2 smiling dogs and declared that it "contains no poison so is absolutely harmless to animal life", which indicated that pets had been known to be harmed by weedkillers and that for some would-be weedkiller users, the safety of their pets prevented them from using weedkiller at all. In contrast, adverts for Eureka focussed on ease of use and the avoidance of backache, without mentioning poisonousness. Eureka contained arsenic, meaning that garden chemical users had to use their own knowledge of the market and interpret what was *not* said as well as what was laid out in the advertising and on the packaging. In this context, effective weedkillers that were safe to humans and animals, as well as could be sold without restriction to certain types of suppliers or with off-putting processes such as scrutiny from shop staff, would have been attractive prospects for both chemical manufacturers and amateur gardeners.

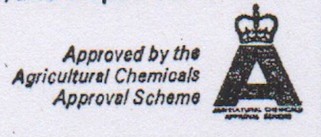
### Pesticides Safety Precautionary Scheme

Until 1957, garden chemicals were not subject to any further regulatory requirements than the Poisons Rules. In the wake of an investigation by the Committee on Toxic Substances in Consumer Goods which specifically looked at new chemical products, a cluster of deaths among farm workers associated with pesticide application between 1946 and 1950 alerted officials to the existence of detrimental occupational health effects of using new agrochemicals.[[23]](#footnote-24) As many of the garden chemicals used at home were the same, or closely related products used in large scale agriculture, the formation of a regulatory scheme to ensure the safe use of agrochemicals was also applicable to domestic users.

The voluntary, industry-regulated Pesticides Safety Precautionary Scheme (PSPS) was set up in 1957 and operated in close contact with the Ministry of Agriculture, Food and Fisheries (MAFF), as a way of avoiding the potential inflexibility of full legislative measures. The Advisory Committee on Poisonous Substances Used in Agriculture and Food Storage, which was later renamed the Advisory Committee on Pesticides and Other Toxic Chemicals (generally referred to as the Pesticides Advisory Committee), as well as the Poisons Board examined then discussed technical reports and proposals with company spokesmen. The committees were composed of experts in branches of toxicology, practiced in examining technical, scientific documents and thinking about risks; neither professional or domestic chemical users were represented on these assessment committees or their input sought, instead they were simply imagined. It is interesting, though perhaps not surprising, that a scheme initiated in response to increasing awareness of consumer rights and consumer power, did not involve consumer groups or union representatives. In fact, this was not challenged until the 1980s and concerns felt by forestry and agriculture workers about the herbicide 2,4,5-T were coming to a head. The absence of users via union representation earned the criticism that committee was an "amateurish body of academics and civil servants",[[24]](#footnote-25) in the view of the union, an expert committee must contain the experts in use. Continued action by unions, and evidently no obvious change in the committee composition prompted MP (Berwick and East Lothian) John Robertson to demand agricultural industry workers, along with Health and Safety Executive be represented on the pesticides advisory committee.[[25]](#footnote-26)

The poor representation of the users through the make up of the commmittee led MP (Yeovil) Paddy Ashdown to complain in 1985 that of the five medical doctors on the committee none were concerned with living patients,[[26]](#footnote-27) i.e. those who may use, misuse or be otherwise exposed to the chemicals examined by the committee. Ashdown's contempt for the academic "rat-doctors" and his distaste for pathologists perhaps indicates where improvements in communicating about the processes could have been made, but these arguments raised the point of whether these laboratory or desk-based men, as they were men, could stand in for the whole range of domestic and professional users. With such technical material, an average gardener would have required more extensive support and time to understand the issues, so the expert members stood in for the users, which of course they also could be. This also allowed PSPS to operate a pragmatic and flexible case by case approach, where assessments of the safety of chemicals were made based on what would now be considered limited toxicological observations of test animals. As the name implies, the PSPS dealt purely with safety factors, rather than the effectiveness of any product, but a programme that covered efficacy had already been in operation for around 15 years, and became formally recognised as the complementary system to PSPS when it was renamed the Agricultural Chemicals Approval Scheme (ACAS).[[27]](#footnote-28) This shows that although effectiveness had been considered important enough to be tested, safety came second, or rather not at all. The situation was turned upside down following the scrutiny initiated by deaths of agricultural workers and the formal recommendation to take safety more seriously meant that new chemicals had to pass scrutiny by PSPS before their efficacy could be considered by ACAS.

The impact of this scheme on domestic users was that they were told that they could feel reassured that the new chemicals arriving on the market could be relied on to be safe (when the carefully worded precautions were followed) and effective. Garden chemical users were encouraged, through the government booklet *Chemicals for the Gardener* and via gardening magazines which picked up public relations material from the Association of British Manufacturers of Agricultural Chemicals (ABMAC),[[28]](#footnote-29) later renamed British Agrochemicals Association (BAA)*,* to look out for the 'A' symbol granted to products that had successfully been approved (Illustration). Manufacturers duly included this in product advertisements and packaging. Some of the processes behind approval and what could be expected of products with the Approved logo were also explained in readily available publications, including those from the Consumers Association.[[29]](#footnote-30)

Illustration 3: The clearly recognisable logo of a crown-topped letter A, denoting that a product had been approved.

The *Chemicals for the Gardener* booklet also took care to emphasise the importance of following the safety instructions given by the manufacturer on the label, because these too had been approved.[[30]](#footnote-31) The warnings and instructions for use were scrutinised as part of the PSPS process because appropriate information reduces the likelihood of accidents, although words on a label or box cannot compel the user to follow them. This was an issue that those in the chemical industry grappled with for every new product. ICI's Frank Rose referred to pharmaceuticals when he said "sooner or later someone will try to commit suicide with it"[[31]](#footnote-32) although the sentiment is applicable to other chemicals. As the research director of chemical company Fisons explained on television in 1964, misuse was viewed as an "inevitable risk" for any new chemical product, including household chemicals. He made it clear that chemists were exceedingly careful to produce useful, effective products that could be used safely, and followed this by directing attention to the user as the cause of any problems when he said "I bet my bottom dollar that someone is going to misuse it so much that even the safest chemical is going to cause trouble somewhere, sometime."[[32]](#footnote-33)

Despite the agrochemical industry aiming to avoid legislation by voluntarily initiating the PSPS, the British government deemed greater protection of consumers desirable, which they sought to foster through the Farm and Garden Chemicals Act 1967. Care was taken to specifically define gardening as including the destruction of weeds in drives, paths and courtyards, meaning it was applicable to householders who perhaps did not see themselves as gardeners in the traditionally creative or nurturing sense. However, results were slow to come about due to expectations that the Act would be superseded soon after, as well as taking into account relevant legislative changes in Europe. Although a marker of the heightened awareness of chemical persistence and serious, unknown, delayed effects on environmental and human health, this Act does not seem to have had much impact on procedures relating to herbicides and it was very rarely referred to in correspondence relating to the control of chemicals studied in this chapter.

Even though it appears to have had limited impact, The Farm and Garden Act is worth mentioning because it emphasised concern for consumers. MP Joyce Butler consistently advocated for consumers and stressed the need for consumers to know what chemicals the product contained, whereas others believed that this information would be meaningless to the average user and what should be prioritised on the limited space available on the product's label and packaging was the instructions, advice and warnings.[[33]](#footnote-34) Butler got her way eventually, and from May 1973 all proprietary garden chemicals had to be labelled with the common chemical names of their active ingredients,[[34]](#footnote-35) although they would not have anything resembling the "at-a-glance toxicity marking" she hoped for until the mid 1980s.

The focus of the Farm and Garden Act was on labelling, which according to the Act should include the name of the substance, a "mark, symbol or colour" to indicate any hazard to "human beings or other forms of life". Where products should be labelled, anyone found to "sell, or offer or expose for sale" an unlabelled quantity of product would be committing an offence and subject to a fine.[[35]](#footnote-36) This suggests that not only did the manufacturer have to label their product appropriately, but that some retailers were selling inadequately labelled, presumably re-packed or decanted garden chemicals and this was considered to be a problem that the Act aimed to rectify. Ultimately, the system of standardised hazard labelling that the European Council made compulsory in 1985 commanded more influence than this Act. It is worth noting that these symbols did not always correspond to the hazards that were understood by the consumers.

Gardeners wanted clear, informative labelling on garden chemical's packaging, but this desire for was not considered met, generally due to the small print necessitated by the size of the product. This can be seen by solutions improvised by frustrated gardeners, shared in magazines such as *Practical Gardening,* who had felt that their personal efficiency in the garden was hampered by user-unfriendly labelling. Examples included the attachment of large labels to overcome illegibly small ones (Illustration)[[36]](#footnote-37) or creating ready reference dosage charts for their selection of garden chemicals (Illustration).[[37]](#footnote-38) What is striking about these examples is that the gardeners focused on personal efficiency, while government targeted safety, something generally not mentioned by the user as a problem with the labels. This is not to say that personal safety was not considered as part of these solutions, for instance the provision of dedicated spoons (Illustration) shows how that domestic user avoided contamination of kitchen equipment. For the users, size was the issue and not one that could be rectified by any parliamentary acts.

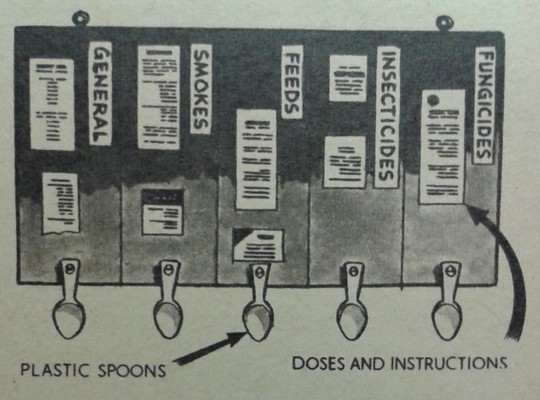
Illustration 4: A reader's suggestion to help gardeners keep appropriate equipment and instructions available for garden chemical use

Illustration 5: Reader's solution to illegibly small instructions on chemical packaging. Measures here all use container caps.

Now that we have covered some of the context of who bought and used garden chemicals, and which authorities were concerned with their sale and use, we can move on to looking in more detail at our selected herbicides, starting with sodium chlorate.

# Sodium chlorate

From the mid 1930s, sodium chlorate become available to amateur gardeners, having been used successfully from the early 1930s on an industrial scale by farmers for clearing land of ragwort, poisonous to cattle, sheep, horses and pigs, as part of pasture renovation. Sodium chlorate was suggested by gardening manuals, magazines and newspaper gardening advice columns for killing isolated weeds in lawns, but its long lasting effects could prevent anything from growing in the treated spot for up to six months, causing a bald patch. This longevity meant that sodium chlorate was singled out as particularly effective for clearing weeds from paths, drives and other areas that could perhaps be described as hard landscaping, that the user intentionally wanted to keep barren. Sodium chlorate was not, under normal circumstances, poisonous to gardeners or other garden users and was quickly seized on as a harmless alternative to arsenical weed-killers "of evil repute".[[38]](#footnote-39)

The National Allotment Society promoted sodium chlorate to domestic users through a series of articles from 1934 which encouraged members to keep their plots tidy.[[39]](#footnote-40) As a result, the journal claimed to have received requests for more information about this wonderful weedkiller and letters from disappointed gardeners unable to obtain it.[[40]](#footnote-41) This was not surprising, as the "foreign product"[[41]](#footnote-42) was only imported to Britain. A likely importer was Albright & Wilson's Oldbury Electro-Chemical Company. They had dominated global sodium chlorate production from their plant at Niagara Falls since 1902,[[42]](#footnote-43) making use of the hydro power available there to run electric furnaces.[[43]](#footnote-44)

Historian of A&W Hugh Podger pinpoints 1932 as when global demand for sodium chlorate as a herbicide increased,[[44]](#footnote-45) but does not comment on why or how this came about. If A&W had realised and promoted the herbicidal potential of sodium chlorate to farmers, it would have been documented by the company and included in Podger's account, so we conclude that this company was not behind the surge in agricultural interest in this chemical. Nevertheless, it is likely that this growth is associated with the positive results shown in worldwide agricultural trials that had been taking place in the early 1930s, as farmers would have required large quantities of the chemical and therefore make a significant impression on the volume demanded, much more than the volume British amateur gardeners would have needed.

The increased demand can be verified by the announcement in 1935 by Staveley's Coal and Iron Company announced that they were to build Britain's first sodium chlorate manufacturing plant, allowing it to compete with Colonial and Continental manufacturers.[[45]](#footnote-46) This decision indicates that the market for sodium chlorate as a herbicide had grown quickly and shown itself to be lucrative, bearing in mind that only three years earlier the idea of using sodium chlorate agriculturally was novel. However, Staveley's did not appear to market products directly to consumers.

The same year that Britain's first sodium chlorate plant was announced, 1935, the National Allotment Society (NAS) responded to the difficulties expressed by would-be domestic users of sodium chlorate regarding obtaining the chemical, and arranged for sodium chlorate to be packaged in quantities appropriate for domestic use, which they made available through their existing seed and equipment business, National Horticultural Supplies.[[46]](#footnote-47) This new chemical was at first inaccessible to domestic gardeners, who were not used to dealing directly with importers or with industrial quantities, until it was mediated and repackaged for domestic consumers by the NAS. By 1940, sodium chlorate was more widely available to amateur users and marketed as a dedicated herbicide packaged in domestically appropriate quantities, including through Boot's who called themselves "The Gardeners Chemist".[[47]](#footnote-48)

Sodium chlorate was purchased by gardeners in a variety of forms, as soluble crystals like salt or an even more easily soluble powder which could be applied to weeds either dry or dissolved in water, in addition to a preprepared solution of sodium chlorate being offered by some manufacturers: Nantcol was a liquid, and the 1981 advert for Cooke's sodium chlorate highlights a liquid form. Gardeners were free to make up a solution to their desired strength using the solid forms, and could dilute the liquid forms to weaker concentrations. Different concentrations of sodium chlorate solution were used to kill different types of weeds; stubborn deep rooted weeds were given the strongest treatment while smaller annual or biennial weeds could be done away with a weaker solution.[[48]](#footnote-49) This gave an apparently crude, total and unselective herbicide a degree of subtlety and allowed the gardener freedom to exercise their judgement in determining what would best suit their particular situation.

Boots' sodium chlorate was sold ready packaged in tins, under the plain chemical name, but it was also available from other manufacturers under brand names, such as "Eureka" sodium chlorate from Tomlinson & Haward Ltd[[49]](#footnote-50) (apparently still keen to capitalise on their well known Eureka brand, although now clearly identifying the chemical as sodium chlorate) and "Nantcol" from Synchemicals.[[50]](#footnote-51) However, even when branded like this it did not lose its true chemical identity, as sodium chlorate remained prominently on the label, making it quite a different strategy to the inscrutable presentation of arsenic products and lawn sand that we saw earlier in this chapter. Like sulphate of ammonia, users could handle it without skin irritation. The following two adverts are typical of those for sodium chlorate, which appeared among the smaller adverts rather than a whole page.

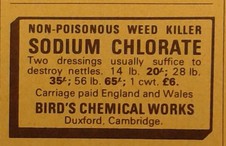
Illustration 6: Advert from 1966, Practical Gardening magazine

Illustration 7: Advert from 1981, Practical Gardening magazine

Sodium chlorate was clearly the chemical that was being sold to gardeners, although each chemical company imprinted their own name on the product. Bird's highlighted the non-poisonous nature of the chemical, where as the Cooke's advert did not. No users were shown in the Bird's advert, while the Cooke's advert showed a man using a watering can, which we presume to contain a solution of sodium chlorate. Potential users were invited to imagine clearing weeds from drives, paths and wasteland in addition to the pictured patio. No information about how long the user could expect the sodium chlorate to last is given, but the listed scenarios do not include any that suggest to the user that they would be growing anything there for a while. The addition to Cooke's product of fire depressants was stressed, as was the chemical's effectiveness and inability to harm the environment. This concern for the environment is particularly typical of advertisements from the 1980s, when this angle was seen as one that could attract users concerned about this issue.

What we do not see in these advertisements is the crowned "A" symbol which would communicate that it has been approved by the PSPS. Indeed, there was no need as these producers were not selling a new chemical, but a relatively simple, well established product: solid crystals or powder, rather than with additives other than fire suppressant which had been incorporated since the 1930s. Large producers, such as ICI and Syngenta, were able to afford to put their sodium chlorate preparations through the approval system, the adverts shown here are from small companies for whom financing this operation would have been prohibitive. Consumers were navigating a fairly complex landscape of chemicals and assurances, but here the identity of the chemical was all they really required.

## Precautions

As alluded to in the Cooke's advert which highlighted the added fire depressant, there was a fire risk involved in using sodium chlorate. This had been long known, if perhaps repeatedly forgotten, as when the solution soaked into gloves or other textiles, then dried, the friction from wearing the sodium chlorate impregnated garment caused the chemical to ignite or explode. Accidental fires with sodium chlorate had claimed lives since its introduction as an agricultural herbicide in the 1930s,[[51]](#footnote-52) and when the NAS first introduced sodium chlorate it highlighted flammability as a concern for gardeners. This danger was initially described as an inflammable gas given off as the garment dried, but later a more comprehensive description of the action of friction was given and users were advised to rinse in clean water any items that had become impregnated with chlorate solution.[[52]](#footnote-53) Occasionally an incident where someone had been burned by a fire involving sodium chlorate appeared in the letters section of a British medical journal, or newspaper, apparently not warranting the attention given by a full article. The only exception to this was when a baby was hurt which made the national news, although the article was so brief that it is hard to tell what happened or what the outcome was.[[53]](#footnote-54) No reference to previous or foreign accidents was given in these accounts of fires, but neither did they carry the full outrage of some danger newly discovered, instead reading as if the information about this risk to the user were indeed quite readily available.

This danger of fire was deemed preferable to the danger of poisoning by arsenical weedkillers, and the unpleasant handling qualities of tar-based compounds, which explained the popularity of sodium chlorate among amateur gardeners for weed clearance.[[54]](#footnote-55) However, not all recommendations for sodium chlorate came with detailed information about safety, and it is unlikely that all users received the same warnings. For instance, when the chemical was discussed in *The Times* agricultural news column, the fire risks were outlined, but this information was not included in the praise for sodium chlorate presented in the paper's gardening column, read by gardeners the following year.

This fire risk meant that sodium chlorate brands were developed for agricultural and domestic garden users with fire retardant chemicals early on in the story of sodium chlorate's domestic use; by 1949 Atlacide was recommended to British amateur gardeners as a brand formulated to avoid fires.[[55]](#footnote-56) American farmers had experimented with Atlacide since 1930, comparing it's effects favourably to unaltered sodium chlorate.[[56]](#footnote-57) This lag between agricultural and domestic use raises questions about the level of engagement from domestic users if they unquestioningly accepted the risk of fire from sodium chlorate without fire retardants and were surprised about ensuing accidents.

However, if domestic gardeners did not read journals associated with their hobby, nor a variety of instructional manuals, it is entirely possible that they would have been unaware of the chemical's flammability, unless informed at the point of sale by their shop keeper. Advice supplied in instructional gardening books varied considerably, from giving no information on the chemical's flammability,[[57]](#footnote-58) to extensive instructions to avoid spilling the crystals or the solution on wooden surfaces as well as to throughly rinse in clean water anything that contacted the solution,[[58]](#footnote-59) while one went even further and recommended wearing rubber boots as protection.[[59]](#footnote-60) These examples highlight how users of the same chemical for the essentially the same tasks could receive quite different information about how to safely use it.

When EC regulations came into effect in 1985 which meant chemical packaging had to carry standardised warning symbols, sodium chlorate would bear the icon for oxidising. While it was the chemically correct description of sodium chlorate's fire starting properties, the chemical had always been described to domestic users as inflammable, and it would continue to be so in magazines and books. This discrepancy seems to have passed without public comment, perhaps indicating that gardeners did not mind about this pedantry, so long as they could still purchase and use the chemical when they wanted it. Both symbols both represent fire, so even if a user did not fully understand the difference, they were able get the gist of the warning.

Illustration 8: The flammable symbol, not used for sodium chlorate, despite this being how the chemical was usually described among and to amateur gardeners.

Illustration 9: The oxidising symbol, the chemically correct description of sodium chlorate's reactivity.

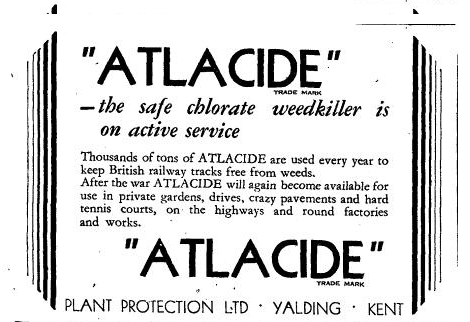
The risk highlighted to gardeners far more frequently than accidental fires was sodium chlorate's propensity to seep or creep into non-target areas and kill or damage non-weeds. To reduce this possibility, users were urged consider the likely future weather conditions as well as weighing up the which plants might come into range if rain caused the weedkiller to spread further.[[60]](#footnote-61) Labour-saving garden designs took into account how easily weedkiller could be applied to paths without harming nearby plants, trees or lawns.[[61]](#footnote-62) The exhortations to consider sodium chlorate creep incorporated the reminder that neighbours' plants were at risk and show that accidental damage was a distinct possibility, but the use of the herbicide to deliberately damage a person's property does not appear to have been a large problem. A vandal targeted multiple gardens of a village where the gardeners were understandably shocked at the severity of the action,[[62]](#footnote-63) but sports facilities rather than domestic gardens, were the most high profile instances of unsolicited weedkiller use.[[63]](#footnote-64)

While vandalism using weedkillers was not something that manufacturers could address, creep and fire risks were undesirable features that could be highlighted by manufacturers and marketers to set their new products apart from sodium chlorate. By 1964, simazine-based products were recommended as preferable to sodium chlorate because they did not creep, nor were associated with fires, and their effects were even longer lasting than sodium chlorate. As simazine could last years in the soil, usurped sodium chlorate's status as the chemical that could give the longest period of effectiveness, and redefined it as a medium-term weed suppressant. Nevertheless, sodium chlorate continued to be recommended and used when a relatively cheap and reliable long term weedkiller was needed.

Although the oxidising properties of sodium chlorate was not a principle concern to gardeners, they were at different times and for different reasons a preoccupation of various governments. In the approach to the Second World War, sodium chlorate was included in the "Prohibited Chemicals" list,[[64]](#footnote-65) a selection of chemicals compiled by MI5 in 1939 believed to be desirable to those who wished to damage national security. Homemade bombs were later the subject of concerned correspondence in 1941 when a German agent was found to be carrying instructions to go to chemists shops and purchase bomb making chemicals, including sodium chlorate. This validated the list and the measures associated with it, but it was hypothesised that while chemists may consider selling 28lb of these bulk chemicals specified in the instructions, a would-be bomb maker would not purchase supplies from a single store, to avoid arousing suspicion.[[65]](#footnote-66) Another route of access to these restricted chemicals pondered by officials was that would-be bombers would join horticultural or co-operative societies, both of which had been identified as potentially distributing chemicals to unrecorded people.[[66]](#footnote-67) This circularity, as we saw the role of allotment societies in informing and enabling access to the chemical, is striking.

Sodium chlorate's availability to legitimate gardeners should have been uncomplicated, although subject to the whims of the retailer. Sodium chlorate's place on the prohibited items list did not meant that it could not be sold at all, but it meant that the sale was recorded, for monitoring purposes. One pound of sodium chlorate was all that a person could buy at any one time, unless they had a police certificate. One pound would be enough to make a gallon of strong, 10% solution for treating deep rooted weeds, or four gallons of 2.5% solution for smaller annual weeds, so this restriction should not have affected most domestic gardeners. The retailer had to fill out a lengthy form declaring that the buyer was known to them and the quantity sold, then return it to be centrally processed. Being asked for an ID card, an address and the reason for the purchase may have been a deterrent to a customer, but the process proved mainly to discourage the vendor. Suttons Seeds worried that they could not properly describe their customers as "known" to them and complained that the number of purchasers of chlorates and nitrates during spring would require an extra clerk to process all the paperwork. While most retailers did endeavour to go through this time consuming process and lots of forms were received in the first year of implementing the scheme, the urgency and enthusiasm for this national duty waned, shown by the tailing off of reporting. Some chemists continued to sell the chemical without reporting, while others preferred not to sell prohibited chemicals at all, as they did not like the bother of dealing with the paperwork.[[67]](#footnote-68)

These measures were not widely communicated among the general public, at least not through mainstream media, and only appropriate retailers were issued with the list of prohibited substances. There had been concern about whether the concept of sabotage should even be included in how the list was titled, fearing that it could inspire this type of misuse. Neither the list, nor any evidence of its implementation, was discussed in gardening magazines or in newspapers, suggesting that gardeners on the whole did not encounter any changes in the supply of their new favourite herbicide that were serious enough to complain or comment about. By 1943, the threat level was declared lowered, and the reporting procedure was lifted on sodium chlorate and most of the other chemicals on the list. Plant Protection Limited's wartime reassurance to their customers (see Illustration) that "Atlacide – the safe chlorate weedkiller is on active service".[[68]](#footnote-69) This brand, as we saw earlier, was formulated to include a fire depressant, but if domestic users understood that the reason that sodium chlorate supplies in general were restricted or reduced because for the good of the country, then they would be less likely to complain about this patriotic sacrifice.

Illustration 10: Advert placed to inform domestic users about the disappearance of this brand from the general marketplace indicates that sodium chlorate was in restricted supply.

With the threat of war over, entertainment motivated schoolboys to employ sodium chlorate's oxidising nature in homemade fireworks and bangers, and the focus of government officials switched from sabotage to child safety, albeit with a post-war lapse of interest in the chemical altogether. Accidents most often occurred during transport of the bangers in a pocket, where the friction caused by walking or running resulted in premature ignition and detonation. Between 1956 and 1966, 242 young people had been injured by homemade explosives containing sodium chlorate.[[69]](#footnote-70) Garden writers called for "serious investigation" into why such a potentially dangerous chemical could be bought in brown paper bags from any hardware shop or chemist without any warnings,[[70]](#footnote-71) but they themselves had rarely noted that the chemical should be handled with care by gardeners and did not cease to recommend its use as a herbicide. This shows an inherent, and unaddressed, distinction about in whose hands a chemical became dangerous. In an adult gardener's hands, sodium chlorate was only a danger to plants, but in a child's hands the chemical became a danger to their intact body.

These accidents involving young banger makers initiated a flurry of parliamentary activity, in which retailers, manufacturers and teachers were all identified as both the source of the problem and the solution. The Home Office announced that it was talking to retailers to prevent sales to children,[[71]](#footnote-72) while parliamentarians questioned whether manufacturers could alter the formulation or delivery of the chemical to prevent it from being used as an explosive, but not affect its ability to kill weeds.[[72]](#footnote-73)

As we saw earlier in this chapter, formulations which included fire depressants already existed, and that liquid preparations did come on to the amateur market, though this was not necessarily marketed as fire prevention, but simply as convenient for the gardener. The continued visibility of sodium chlorate's potential for misuse appears to have stimulated some manufacturers to change their formulation, such as ICI, who by 1970 advertised that their sodium chlorate weedkiller contained fire depressant.[[73]](#footnote-74) This showed that the company were keen to avoid their amateur gardening products being connected with accidental fires, not to mention deliberate explosions.

The focus of concern tended to be the protection of children who might use the chemical to make bangers, rather than more serious, politically motivated, adult explosive-makers, although the politicians did keep the legitimate user of sodium chlorate in mind with their desire to not alter the herbicidal properties of the chemical.[[74]](#footnote-75) The implications for gardeners of any changes to the soil of adding fire suppressant chemicals such as sodium chloride, sodium carbonate or borax,[[75]](#footnote-76) were not discussed in gardening publications, possibly because sodium chlorate was used for total, rather than selective weedkilling and was expected to be long term so any changes to the soil wrought by the new additives went unnoticed or were negligible by the time the area was replanted, so long as the product applied was seen to effectively kill weeds. This indifference by one set of users to the measures implemented by manufacturers to accommodate the alternative use by another set of users should be remarked upon.

Dr Hugh Black of Her Majesty's Inspectorate of Explosives recommended that science teachers left out details of sodium chlorate's explosive ability from their classes.[[76]](#footnote-77) It is interesting that teachers, not parents, were called upon to put down bomb making among schoolboys. Even though police acknowledged that children did not make bombs at school, or even on school premises, which implies that they were doing it on domestic property where presumably adults were in charge, head teachers were prioritised over parents or guardians for instilling sensible behaviour. Parental discipline appears to have been futile, at least in the reporting of the incident that led to these pleas to teachers. In that particular case, a boy lost a hand in a sodium chlorate explosion despite his parents' attempts to stop him making explosives. The child began making small bombs with a chemistry set, then graduated to making larger bombs with weedkiller and sugar. The parents confiscated their child's bomb making equipment but the child was easily able to replace his supplies, causing the parents to call for traders to stop selling sodium chlorate to children.[[77]](#footnote-78) These particular parents had attempted to protect their child from explosions, but they'd probably also encouraged his interest in them by giving him a chemistry set and presumably the means to buy more supplies through pocket money, unless he had a part-time job. A commercial chemistry set was named as the gateway to bomb making, rather than any motivation originating within the child, and shop keepers were identified as responsible for controlling access to chemicals, which to a certain extent they were. In contrast to this, parents were held in highest responsibility by R.E. Parker, writing on behalf of the Royal Institution of Chemistry. The Institute identified "adventurous boys" as the experimental users of sodium chlorate in the search for bigger, better bangs, and called for better education of parents and these youths through improved labelling and information at the point of sale.[[78]](#footnote-79)

Progress on the subject of preventing sales to minors was slow and in May of 1970, Boots sent out a special announcement to all of its shops, which requested that tins of sodium chlorate be displayed out of the reach of children, and instructed staff to affix labels that declared the product should "not be sold to children under 18" to each tin in stock.[[79]](#footnote-80) These actions show that Boots was serious about attempting to stop the sale of that chemical to young people, who were deemed particularly likely to use it for pyrotechnic purposes. The long delay between the discussions and one of the major retailers of sodium chlorate taking steps to restrict the chemical may indicate quite a number of possibilities, including resentment at the assumption that sales staff would not question or refuse a youth, opposition to tighter controls in general, or the difficulty in implementing them. Despite Boots' efforts to prevent sales to minors, their continued production of sodium chlorate weedkiller without a fire depressant[[80]](#footnote-81) somewhat contradicted their efforts.

The blame for firework injuries can be lifted a little from sodium chlorate, at least during firework season. Between 1965 and 1970, at least for the times between 11th October and 7th November, homemade explosives were responsible for fewer accidents than commercially bought fireworks. The statistics were complied because fireworks were under particular scrutiny with regards to the development and imposition of manufacturing safety standards and prevention of sales to children. Homemade fireworks were responsible for a small fraction of accidents, 4%, compared to the 31% caused by shop bought bangers, and while this does not really give an idea of how many people were using sodium chlorate for this purpose, it does not seem to be a major use of the chemical. The total number of accidents decreased each year from 1965 to 1970, with accidents relating to homemade explosives following that same trend,[[81]](#footnote-82) despite no formal changes in sodium chlorate sales. A large educational campaign about firework safety in general, including a graphic and forceful BBC documentary *Remember Remember*, was credited with having achieved this reduction.

Although the sale of sodium chlorate to children might have been a problem, there was another route that labels and restricted sales could not address. Obtaining an amount from a relative's herbicidal stock was even further beyond governmental influence than sales, but this potentitally more frequently used supply route does not appear to have been discussed, nor any specific education directed towards adult gardeners about the possibility of guarding against their supplies being pilfered for this use. Certainly it was not suggested in the newspaper or magazine gardening columns that securing personal supplies against this use might be considered.

Entertainment or "adventurousness" was not the only reason for mixing homemade explosives. As well as bangers, bombs were also made. Newspapers dubbed them "two bob bombs"[[82]](#footnote-83), referring to their inexpensive nature. The same principle as bangers, but generally larger, the bomb makers sought revenge, fear and damage, with examples reported in newspapers of a bomb set by a disgruntled customer,[[83]](#footnote-84) and one left under a woman's car by her jilted husband.[[84]](#footnote-85) Invariably, these bomb makers were men or boys. Globally, 1970 saw increased employment of chemicals used in agriculture and the garden to construct bombs in the name of political terrorism, as a result of tightened controls on commercial explosives. The oxidising nature of sodium chlorate was put to work in variety of ways beyond simply starting fires. In 1970s Northern Ireland the IRA, Provisional IRA, Ulster Volunteer Force and Ulster Defence Association used sodium chlorate in a variety of ways, not simply as a crude explosive. Sodium chlorate mixed with nitrobenzene as the filler in pipe bombs, but it was also used as propellant, (along with another household item, the J-cloth) for ammonium nitrate mortar bombs,[[85]](#footnote-86) and as a component in delayed chemical ignition systems for bombs, though access to one other necessary part, a condom, for the delay switch marked out the users as not-Catholic.[[86]](#footnote-87)

Although these explosives were called homemade, this moniker was used to convey that the materials were assembled by individuals rather than purchased as ready made military provisions. Lock up garages and other non-domestic buildings, not domestic garages attached to homes, were used as bombmaking sites. This removal from the home was to reduce danger to other family members as well as to minimise forensically incriminating materials from the home from becoming associated with the bomb. However, other less well-informed and professionally organised bomb makers no doubt did construct devices at home, and arrests made of members of anarchist group the Angry Brigade (unrelated to the ideologies of the Troubles) found bomb making equipment and chemicals, including sodium chlorate, at their home address which demonstrate this.[[87]](#footnote-88)

Frequent high profile bombings carried out by paramilitary organisations who used sodium chlorate in explosives in Northern Ireland led to the imposition of restrictions in that region on sales of the chemical in 1972. Although the idea of restricted sales of sodium chlorate to prevent its use in terrorism was supported in principle, Whitehall politicians also stressed their reservations about the effectiveness and reach of this gesture. Perhaps the experience from 1939 into the 1940s of the Prohibited Chemical List; the limited effectiveness and resistance to sales monitoring was not completely forgotten, but it was not mentioned by name. Enoch Powell called the order "pathetic" and "unlikely to correspond with any of the hopes expressed in connection with it".[[88]](#footnote-89)One parliamentarian recalled his own experience with the unreliability of sodium chlorate, or rather the reliability of it to backfire when making homemade fireworks in his attempt to refocus attention to the arguably more serious threat of systematic theft of commercial explosives and detonators from industrial sites.[[89]](#footnote-90) Through the desire not to disrupt benign domestic use, nor cause trouble to manufacturers and retailers, but to be seen to take action against the bombers, the order was ineffectual. Despite regular and publicised arrests relating to unlicensed bulk transport of sodium chlorate, the chemical continued to be used in explosives throughout the conflict.

This deliberate use of the chemical for destructive purposes, nor the huge, accidental explosions which occurred at residentially located storage depots, causing homes to be evacuated in Renfrew (1977), Barking (1980)[[90]](#footnote-91) and damaging homes in Salford (1982),[[91]](#footnote-92) did not appear to shake gardeners from their keenness to use sodium chlorate. Although some experts had claimed not to know that sodium chlorate could detonate when heated, there was evidence that it was long known that it did.[[92]](#footnote-93) From the lack of discussion or need for reassurance in the gardening media, domestic gardeners seemed to be able to, entirely reasonably, compartmentalise the problem of explosions to the way that large amounts were warehoused, and not attribute the same possibilities to the comparatively minuscule amounts stored in homes. In this case, the problem was not the chemical, its uses or users, but with planning procedures which allowed close proximity of chemical warehousing to residential property, as well as standards of warehouse management and accident preparedness. The distinction between the chemical nature of sodium chlorate's flammability, it's oxidising ability, role as a propellant or likelihood to detonate was irrelevant and therefore not of concern to the average home user.

It should be noted that the calls for the addition of fire suppressants to sodium chlorate which had been prevalent during the 1960s when children had been involved in accidental explosions, dried up when sodium chlorate was used in intensive political terrorism in the 1970s. It might have been expected that manufacturers would have been publicly called upon to help prevent this use. However, the readily available British Agrochemicals Directory, published from 1970, listed manufacturers of sodium chlorate herbicide and described whether it included fire suppressant, which showed that numerous suppliers continued to offer pure sodium chlorate. It could be argued that fire suppressants could have had a larger role in preventing the chemical from being misused in this way and that the government, and the agrochemicals associations, could have taken more serious approach to security had they insisted that all suppliers added this safety measure, as it did not appear to change the herbicidal performance of the chemical. No manufacturers or particular brands of sodium chlorate used in these attacks were publicly identified, and the analytical capabilities of this period were not yet advanced enough to distinguish the manufacturers of apparently identical products, so only the chemical, not the producer, was implicated in attacks. This meant that chemical companies were not held to account for producing chemicals that could be used in this way, and the paramilitary users of the herbicide able to continue.

### Poisonings

Although sodium chlorate's reputation as harmless and nonpoisonous, this did not stop people from using it as a poison. In the case of sodium chlorate, the poisoners were both men and women. Sodium chlorate was reported by a pathologist as tasting noticeably bitter, making it unsuitable for surreptitious poisoning, but this did not stop people from trying, allegedly adding it to sandwiches,[[93]](#footnote-94) tea,[[94]](#footnote-95) and cereal.[[95]](#footnote-96) These British cases were unsuccessful poisoning attempts, carried in newspapers for their human stories of love affairs, angry husbands and suspicious wives, while disseminating the message that sodium chlorate was not an effective poison for humans.

Despite this insistence that sodium chlorate was harmless, recovery from chlorate poisoning involving doses of 20g or more was rare, and sodium chlorate was used for deliberate, fatal self-poisoning.[[96]](#footnote-97) However, it was even rarer to find mention of this use outside medical journals, except as part of a failed and farcical attempt.[[97]](#footnote-98) For this reason of low news exposure, despite being readily available to gardeners, this use did not become popularised. Similarly to the use of sodium chlorate in explosives, no brands were ever publicly identified in poisoning cases, but that is not to say that the chemicals used were unbranded. With respect to its use as a poison, the brand is irrelevant as the effect of any of the brands would have been the same, unlike the situation with the presence or absence of fire suppressants and their role in preventing the misuse of the chemical as an ingredient in explosives.

Other than occasional autumnal calls for controls on sales to children, sodium chlorate remained on sale until 2009. When its withdrawal from the market as a weedkiller was announced, devotees stockpiled the chemical and lamented the loss of such an effective weedkiller. The use of electronic message boards also enabled the recording of gardeners' awareness and blaming of groups who may misuse the chemical, coming in the wake of homemade peroxide-based bombs being used in London by Islamists, as well as blaming the EU for wanting to put a chemical with a practical track record through laboratory testing. This ban on sodium chlorate weedkiller sales is ineffective, and the chemical can be easily found. Instead of being offered as a herbicide, it instead carries a warning that the chemical, ostensibly for leather tanning use, will kill all plant life if applied. These tactics are negated by the fact that even if the seller had not categorised it as a weedkiller for driving sales, the aggregation of website user information such as which other products they considered or bought, mean that sodium chlorate is identified as being sought out by gardeners hoping to solve problem weeds. Other users in their product reviews, rather than the manufacturer, supply information about how to use it on weeds.[[98]](#footnote-99) The birth and growth of online sales, as well as communication among users and misusers, as all the users in this example do not use the product for leather working or bleaching, will provide rich topics for further historical investigators.

# Paraquat

Of the tw herbicides in this chapter, paraquat is the most complex, both chemically and in it's relationship to users, making this section lengthier than the other studies. Unlike the other chemicals in this chapter it was not recommended for use on lawns, instead it was for weeds in cultivated beds. Paraquat was brought onto the market in 1962 by Imperial Chemical Industries (ICI) as an agricultural and horticultural product called Gramoxone, then Weedol for amateur gardeners was marketed from 1965. As a newly synthesised chemical to be marketed in Britain, it had to pass the scrutiny of the Pesticides Safety Precautionary Scheme in terms of its danger to the health of users and others, then the Agricultural Chemicals Assurance Scheme regarding its efficacy. Paraquat quickly acquired a reputation as a "killer chemical" and not just for its action on plants. Since it came onto the market, acute paraquat poisoning has been responsible for more deaths in Britain than all other pesticides combined.[[99]](#footnote-100) This section of the chapter looks at the development of paraquat as a herbicide, its uses in Britain, and how some users ignored the categories set by the product makers.

'Paraquat is the B.S.I. (British Standards Institution) common name of the cation 1,1'-dimethyl-4,4'-bipyridylium, which is available as the dichloride of the di(methyl sulphate).'[[100]](#footnote-101) This formal, chemical description of paraquat instantly shows us that we are dealing with quite a different substance to sodium chlorate. That compound name is clearly linked to the elements from which it is composed whereas paraquat's relationship to its chemical make up is far more obfuscated to the average user. First synthesised in the nineteenth century and used as a redox indicator dye,[[101]](#footnote-102) the herbicidal potential of the paraquat was observed by ICI in 1947. Work started in earnest to characterise, test and formulate weedkillers based on paraquat from 1955. This endeavour took place at a subsidiary company of ICI, Plant Protection Limited (PPL) at their test farm Jealott's Hill (see table 1).

ICI widely promoted paraquat as a revolutionary new herbicide[[102]](#footnote-103) before all its uses properly worked out and the production processes been made efficient. Even the domestic variant Weedol was on the market in 1965 before an streamlined manufacturing method was fully in their grasp. ICI must have gained confidence from their track record with their herbicide MCPA, and their network of farming contacts that there would be enough demand for paraquat to continue investing in improvements to the manufacturing process.

**Finding uses for paraquat**

When paraquat's strong herbicidal qualities were shown to be deactivated by contact with the soil, chemist William Boon seized this as the unique property should be focused on, and persuaded his reluctant colleagues that paraquat was worth developing. Paraquat was absorbed by plant leaves, then interrupted photosynthesis which resulted in plant death. It was also unselective, killing all plants. As seen earlier in this chapter, gardeners liked to use sodium chlorate for its generally unselective but long lasting effects. Other recently developed weedkillers such as Fison's simazine, and PPL's MCPA were embraced by agriculturalists and home gardeners for their selectivity and long lasting action. A 1958 market survey indicated that there was a strong demand for similar, even more selective, hormone weedkiller,[[103]](#footnote-104) which made the concept of an unselective herbicide that was deactivated quickly by the soil seem unappealing.

If ICI had prioritised the demand from users for similar, long lasting, more narrowly selective weedkillers, they would not have developed paraquat, which was none of these things. Carrying out market surveys to guide product development was helpful, but ICI also had a test farm and a network of farmers which meant that the company were in tune with the problems growers faced in agriculture. Their research culture meant that they could approach problems quite differently to the farmers and therefore create and promote effective solutions that their customers had not considered.

In paraquat's properties Boon saw the potential for not just a herbicide but completely new systems of arable farming and pasture regeneration.[[104]](#footnote-105) Domestic users and the scenarios that they might use paraquat for were not at the forefront of his mind, this market was of secondary importance to large scale agricultural users although plans for a domestic paraquat product were in place early on in the development process. The main feature of agricultural paraquat use: a mulch of dead vegetation on the surface which was not ploughed or dug in, thus retaining moisture and preventing soil erosion,[[105]](#footnote-106) was not one that would please aesthetically oriented gardeners, unconcerned by erosion. Ruth Stout, a promoter of no-dig domestic gardening and composting in place similar to the agricultural method proposed by Boon, recorded a common occurrence among visitors to her garden: they marvelled at the productivity of the plants and the sense behind the low-effort practice, but commented that the untidiness was not something they wanted for their own gardens.[[106]](#footnote-107) This aspect of the aesthetics associated with domestic herbicide use was formed a key part of user acceptance tests, carried out by PPL and ICI staff in their own gardens.[[107]](#footnote-108) Their reported experiences demonstrated that when paraquat was used on young weeds, the dead vegetation quickly dissolved away and was visually satisfactory.

| **Date** | **Regulation/context** | **ICI Activity** | **Paraquat Event** |
| --- | --- | --- | --- |
| 1883 |  |  | Paraquat first synthesised, used as redox indicator (not ICI) |
| 1927 |  | ICI bought Jealott's Hill farm, set up propaganda unit |  |
| 1933 | Pharmacy and Poisons Act, est of Poisons Board |  |  |
| 1937 |  | Formed Plant Protection Limited with Cooper McDougal and Robinson |  |
| 1947 | Fuel crisis holds up manufacture of raw materials needed by chem ind. |  | Herbicidal activity discovered at ICI |
| 1952 | Agriculture (poisonous substances) Act |  |  |
| 1954 |  |  | Boon and others moved from Dyestuffs at Blackley to Jealott's Hill |
| 1957 | Pesticides Safety Precautionary Scheme; Consumers Association (Assocn for Consumer Research Ltd) | Alderley Park opens and Pharmaceutical Division moves there, independent |  |
| 1959 |  | PPL losing money, became wholly owned by ICI, restructure of PPL | First large batch paraquat made |
| 1961 |  | Paraquat pioneer production plant |  |
| 1962 | Silent Spring published | Second production plant for paraquat, Gramoxone enters agricultural market |  |
| 1965 | Chemicals for the Gardener v2 | Weedol enters domestic market |  |
| 1966 |  |  | First paraquat related deaths recorded |
| 1967 | Farm and Garden Chemicals Act passed (not in force until 1973) | PPL gains Queens Award for export activities, mainly due to paraquat |  |
| 1968 |  | Improved paraquat production plant | 1st paraquat deaths reported in mainstream media, added to Poisons List |
| 1972 | Poisons Act, Poisons Board cont. |  |  |
| 1973 | oil crisis; Economic recession until 1975 |  | Patent expires, but ICI remain only producer in UK |
| 1974 | Health and Safety at Work Act; Health and Safety Commission established | Stenching agent added to Gramoxone | Stricter rules for poisons sales. |
| 1975 |  | Weedol changed to include diquat, reducing the paraquat content. |  |
| 1977 |  | Emetic added to all formulations |  |
| 1981 | Wildlife and Countryside Act |  |  |
| 1986 | HSE enforces pesticide safety |  |  |
| 1987 |  |  | Germany refuses to use paraquat |

Table 1: Timeline of relevant company activities and key events in paraquat's development

### Decisions about the formulation

PPL had a lot of experience manufacturing and handling dry agrochemicals in the form of dusts, powders and granules, and farmers already had equipment to apply these forms of product. The agricultural paraquat products, including Gramoxone were a departure from this. Gramoxone arrived with farmers as a brown liquid containing paraquat at a concentration of 20%, which users diluted in their new, specially designed, dedicated application equipment. To domesticate paraquat, PPL planned to offer a less concentrated liquid amount in a smaller volume to home gardeners, branded as Weedol.[[108]](#footnote-109) This type of scaling down was a common practice in diversifying the market for agrochemicals, and although the product was sold as a weaker concentrate, when they were diluted they were equally effective. Giving domestic users a less concentrated product avoided the risks associated with in storing a high strength chemical at home. However, these differences and rationale were not explained to either agricultural or domestic users.

A risk of storing concentrated paraquat was that is was very corrosive. The corrosivness determined the materials in which Gramoxone was stored, first in glass bottles, later polythene bottles, rather than metal which corroded.[[109]](#footnote-110) The Advisory Committee on Poisonous Substances Used in Agriculture and Food Storage were content that corrosiveness would not be a serious problem for agricultural users.[[110]](#footnote-111) They were expected to be used to handling similarly noxious chemicals, and to obediently follow ICI's instructions to immediately wash off splashes of concentrate, as well as to avoid prolonged contact with the dilute solution.[[111]](#footnote-112) Disruption of finger nail growth and nosebleeds in ICI staff formulating and packing the chemical had also been observed. These were interpreted as emphasis on the need to use protective clothing and to avoid contact with paraquat, but the conditions of exposure that these staff experienced were not considered relevant to the intended use of the herbicide by agricultural and domestic users. A variety of possible biological mechanisms were discussed by the scientists on the committee and company representatives, but exactly why ICI workers experienced those symptoms was not known.[[112]](#footnote-113)

While the regulatory board considered the agricultural users competent to handle corrosive chemicals, members of the committee were apprehensive about allowing domestic users to handle such a liquid. ICI had considered the everyday domestic encounters with potentially harmful liquid chemicals, such as bleach, caustic soda, and ammonia suitable experience for handling liquid paraquat. The regulatory board did not take this approach, considering the training and experience agricultural workers had with agrochemicals to be the only suitable qualification for safely handling concentrated liquid paraquat preparation. The committee refused to give Weedol clearance and directed the company to look at alternative preparations that would avoid splashing or spilling corrosive liquids. This shows that the committees could influence the chemical company, as PPL developed a solid, granular paraquat preparation. This was presented to the domestic user as pre-weighed sachets of pellets containing 5% paraquat, to be dissolved directly in a watering can or sprayer. In this way, amateur gardeners did not have to handle the product to measure it out, it was less likely to splash providing they mixed it carefully, and there should not be any left over granules or liquid to store. Gardeners were also instructed to not alter the proportions to make a more concentrated solution, so the freedom that experienced with sodium chlorate to use as they saw fit for their own garden was specifically ruled out and some of the expertise required for using a garden chemical was removed.

As well as addressing the handling qualities associated with domestic use of corrosive chemicals, PPL provided toxicological data to satisfy the PSPS. It had to be established whether paraquat was poisonous, so observations on test animals were made to find out what happened when paraquat was applied to the skin and ingested. The mode of action in plants, being the disruption of photosynthesis, was not considered an applicable danger to animals (although the finer details of this disruption had implications for the treatment for ingested paraquat[[113]](#footnote-114)). Results of lethal dose tests on rats showed paraquat had no effect when eaten in small doses, but it did kill when it was eaten in large amounts. The corrosive nature of paraquat meant that it irritated the skin, although paraquat did not cause the cataracts that closely related chemical diquat appeared to. As far as anybody could tell, paraquat was a skin irritant, it disrupted nail formation and it could be poisonous in large doses. Tissue examinations did not show any particularly unique toxicity, though the collection of fluid in the lungs was noted and not thought to be the cause of death,[[114]](#footnote-115) although the toxicologists were concerned that humans would not eliminate the chemical faster than rats, which could render more harmful effects.[[115]](#footnote-116) There was no requirement to further investigate the poisoning or its treatment, so the only advice ICI could give in case of "gross contamination" was to provide generic first aid.[[116]](#footnote-117) Until the chemical had been used in real scenarios, with real users, they could not know for sure what all the effects on people could be.

Following the granulation of Weedol and provision of limited toxicological information, in 1964 the domestic paraquat preparation was given provisional commercial clearance by MAFF. The first users of Weedol were ICI's own staff. These were real users in real garden situations, rather than carefully controlled laboratory conditions, and they were able to feed back information about their experiences as users directly to the company. Key concerns were how easily the granules dissolved, and what weed kill rate was achieved. Some experimental users found the granules made a foamy solution, or that the solution was so cloudy they could not tell if the granules dissolved. Some found a sediment at the bottom of their watering can, which could not be dissolved further. Although the solution did not block watering can roses or sprinkle bars, the presence of sediment could indicate waste to some users, especially the cost-conscious ones, and probably drove the inclusion of a helpful tip in the instructions to use warm but not boiling water to ensure the granules dissolved more completely. Comments about using the packaging also helped to avoid accidental spillage and wastage or unwanted handling when the containers were opened. These experimental users also raised questions about the size of commonly owned watering cans, and thus what could reasonably be expected to give reliable results if a single use sachet was used.[[117]](#footnote-118)

ICI's experimental users also confirmed which weeds gardeners commonly wanted to remove and indicated what would or would not be killed successfully with Weedol. Docks, nettles and couch grass were reported as particularly resilient, especially when the weeds were above a certain size. Controlled tests in the laboratory had shown that paraquat could kill both broadleaved and grassy plants depending on the dose, although domestic users were discouraged from altering the strength of the weedkiller through the provision of sachets to be dissolved in a standard quantities of water.[[118]](#footnote-119) Therefore, the instructions for best use of Weedol were tailored to draw attention to applying the herbicide to young, small weeds, rather than to complicate matters by restricting the types of weed it could be used on.

The provisional status of the PSPS approval for Gramoxone and Weedol meant that once the chemicals were on sale ICI remained in regular contact with MAFF and the expert committees monitoring safety and efficacy. ICI and committee members collected information about all accidents relating to paraquat products, often initially from coroners reports which appeared in newspapers,[[119]](#footnote-120) so that sales restrictions and printed warnings on labels affixed to packaging could be reevaluated and amended if necessary. Although all this regulatory activity was behind the scenes, it was communicated in part to users. In early adverts for Weedol, the "Approved by the Agricultural Chemicals Approval Scheme" logo was clearly displayed, either visible on any packaging or integrated into the advert body.[[120]](#footnote-121)

In 1964, after two years of incident free use of Gramoxone, accidents began to happen which confirmed that paraquat was indeed poisonous to man when it was ingested, and that humans were even worse than rats at eliminating it. Rats had turned out to be an unfortunate choice of test species, with dogs and monkeys having a more similar reaction to the chemical.[[121]](#footnote-122) These accidents with Gramoxone related to two specific instructions: that it must never be repacked and that it was "not to be taken". These instructions indicate that the chemical company was aware that some users decanted agricultural chemicals into other containers, and were concerned that this could lead to an accident, either relating to the chemical incompatibility with the container material, or of mistaken identity, specifically drunk in mistake for a beverage. However, in carefully wording the instructions, the consequences of disobedience were not explained, so the significance of the instructions was diminished.

Following these earliest accidental poisonings, Roy Goulding founder of the National Poisons Information Bureau[[122]](#footnote-123) and a member of MAFF's Poisons Board which fed into the PSPS, wondered how to prevent further accidents: "How we can deter them I don't know, but labelling the concentrate as poison might help.” Pressure also came from representatives of agricultural users, when the Essex branch of the National Farmers Union (NFU) wanted the severity of dangers of misusing Gramoxone to be emphasised on the label.[[123]](#footnote-124) ICI had been resistant to suggestions that the word "Poison" should be included on the label, as they did not want potential users to be scared by the product being categorised with strychnine and arsenic and avoid their product, nor did they want people to use it as a poison. They called attention to other agricultural chemicals that only needed to have the word "caution" on their labels despite their acute toxicity in rats being greater than that of paraquat. They maintained that when users followed the instructions, the product was safe.[[124]](#footnote-125)

While the PSPS advisory committee accepted that no deaths had followed appropriate use, they were concerned about deaths of those who were not using it for the specified purpose and did not follow the instructions. They decided that liquid formulations of paraquat should be included in the lowest grade, Schedule II, of the Poisons List,[[125]](#footnote-126) effective from August 1968 This demonstrates how a very small number of disobedient users of paraquat outweighed the majority of obedient, safe, careful users and caused the chemical to be classified as a poison. Although the reclassification really only affected the labelling, because Gramoxone was already sold as if it were a poison, the frustration that accompanied the reasons for changed status was clearly visible in the letters exchanged on the topic.

### Retail

Since its introduction in 1962, Gramoxone was only been sold by PPL's farm advisors or through registered merchants of agricultural chemicals to bona fide agricultural users, not to people who wanted to use it at home. This was an agreement, rather than a legislative restriction, demanded by the company and the PSPS. The minimum packaged volume of Gramoxone, 1 gallon,[[126]](#footnote-127) was much larger than a domestic user would ever need for their own garden, and the cost of this quantity was considered high enough that small-scale domestic users ought to have been deterred. Should these prohibited users try to negotiate with the retailer for a smaller amount, retailers were expected to adhere to the same instruction given to users, to never repack or decant Gramoxone into other containers. In this way, retailers were counted on to control access to Gramoxone as this information was not imparted to domestic users by any advertisements or promotional material they might have seen, especially as they may have only taken away the message of the active chemical, not the associated brand names.

Not all retailers were strict, and there was demand from small scale agricultural users, crofters and people with small holdings to break down the bulk amount into smaller portions. These types of users, especially in Ireland according to ICI, were likely to buy small amounts of agricultural chemicals in reused containers such as drinks bottles and store them in their homes and so were disproportionately accidentally poisoned.[[127]](#footnote-128) Other than pointing out this regional difference, the company did not offer any further comment on retailers or purchasers who broke the condition of sale not to repack. In 1967 ICI sent what they called a "strongly worded letter" to its main agents and distributors reminding them about the dangers of selling Gramoxone that was not in its original container.[[128]](#footnote-129) IThis problem was not confined to Ireland, a court case in Cambridge saw a chemist found guilty of gross carelessness and fined after they sold Gramoxone in a reused lemonade bottle to a schoolmaster and delivered it to his doorstep. Luckily in this instance no-one was poisoned.[[129]](#footnote-130)

Additionally, the message needed to reach beyond the main retailers, and organisations such as allotment societies that were not already subject to formal regulation should have been approached with the message that Gramoxone must not be sold by unregistered sellers, and should not be repacked. Allotment associations had been identified as a potential route of permeability in the separation between bulk and domestic use,[[130]](#footnote-131)and perhaps inevitably they were the source of some illicit paraquat that ended up in homes.[[131]](#footnote-132) Despite this, there was no centralised, systematic or sustained effort to reach these organisations. Home Office representatives stated that getting the message to them was not their job, and that general campaigns about household safety which included information on preventing poisonings from pharmaceuticals and other chemicals should be sufficient.[[132]](#footnote-133)

George Staples was a member of a horticultural club who had bought a share of agricultural strength paraquat, and kept it at home in a bottle marked "poison".[[133]](#footnote-134) His troubled teenage son deliberately took the herbicide in 1971 and subsequently died. Staples wrote to his MP to complain about the suffering caused by the processes involved in a coroner's inquest and the lack of anonymity in its reporting. Staples declared that he was "astonished... and disappointed" that there was no recommendation to withdraw the weedkiller, and compared the situation to the investigation of an aircraft crash which should be to prevent a similar occurrence ever happening again.[[134]](#footnote-135) The father was particularly aggrieved that publicity following the inquest focused on his illicit behaviour of decanting concentrated paraquat, an attitude which conflicted with the coroner's view that publicity on the dangers of doing so was an important part of preventing this type of domestic misuse of paraquat.[[135]](#footnote-136) It must have been a very difficult letter for Gordon Staples to pen. He was unusual among relatives of paraquat poisoning victims, as this letter is the only one that appears in the Home Office archives. The only other traces of reaction from relatives are found in newspaper reports of the inquests of poisoning, which carried only short statements of regret about their disobedient actions, as in the case of Mr Parsons who's daughter Deborah was accidentally poisoned by Gramoxone he brought home in a Pepsi bottle who said "It was my own stupidity".[[136]](#footnote-137)

Coroner's inquests are much more limited in scope than air crash investigations, they focused on individuals' unnatural deaths rather than the complex networks and actors involved in catastrophic aircraft accidents. Recommendations could be made to prevent further similar cases,[[137]](#footnote-138) and indeed, as coroners act on behalf of the Crown, they have an obligation to protect others through their recommendations.[[138]](#footnote-139) It is not clear from Mr Staples' letter whether he wanted action to be taken against the company, but when he wrote in 1971, this scenario had already played out many times before and the horror that it would continue to devastate families was evident. It is impossible to know why Mr Staples chose to use the agricultural concentrate over the far safer Weedol, as there is no reflection on the variety of products available in his letter, although it was a point made by both the coroner, and by Home Office representatives responding to Mr Staples' MP, that horticultural societies are associations of amateurs and therefore not considered the correct users of agricultural products.[[139]](#footnote-140)

Amateur gardeners and other small scale users such as allotment holders, should not have had to ask retailers to break their agreement, or to deceive them or find loopholes, as Weedol was widely available from 1965, found at garden nurseries and home improvement centres,[[140]](#footnote-141) chemists including Boots[[141]](#footnote-142) and Timothy Whites,[[142]](#footnote-143) as well as general stores like Woolworths.[[143]](#footnote-144) Weedol adverts suggested simply going to "your shop",[[144]](#footnote-145) rather than list the diverse outlets that users might prefer to buy this type of chemical. Weedol was packaged for shelf display, with plenty of information incorporated on the exterior of the packet. This design did not require a gardener to interact with a shop keeper or assistant, beyond processing the sale. Even some of the language in the instructions had been simplified, with "weedkiller" in place of herbicide and "breathe" instead of inhale.[[145]](#footnote-146) It may have been unusual for Gramoxone and Weedol to have been sold in the same shop but where they were, as may have been the case with the Cambridgeshire chemist, the retailer should have directed the user to the correct paraquat product.

The legal status as a poison should have meant even stricter enforcement, but no sign that paraquat was taken especially seriously by retailers or local authorities has been forthcoming despite needing to register to sell the agricultural products. In publicising this change, care was taken to explain that the granular Weedol for amateur gardeners was exempt, even if the differences between the two products were not clarified more widely.[[146]](#footnote-147) ICI blamed those "silly and irresponsible"[[147]](#footnote-148) retailers who had broken the conditions of Gramoxone's sale for this restrictive change.[[148]](#footnote-149) However, this supposed tightening of retail to domestic users was ineffective, or at least did not last very long, demonstrated when in 1972 reporters from the Daily Mail experimentally bought Gramoxone from different vendors around the country. The journalists were surprised at how easily the agricultural chemical was sold to them, and they found generally very low levels of interest in their background or what their plans for the chemical were.[[149]](#footnote-150) The volume of negative publicity that paraquat received worried agricultural users. The NFU, who had earlier called for stronger wording about the toxicity of paraquat, were anxious that clamping down on retailers would make Gramoxone more difficult for farmers to obtain for legitimate and necessary purposes.[[150]](#footnote-151)

Continued press publicity of deaths from paraquat poisoning "which have usually resulted from the carelessness of individuals" was pinpointed as the cause for public concern which prompted calls for stricter controls on the sale of paraquat. Here carelessness applied to an inadequately-interested retailer as well as the domestic user themselves. In 1974, further restrictions, at least in name, were placed on the sale of Gramoxone when it was reclassified as a Schedule I poison, and this was well publicised when newspapers picked up MAFF's press release.[[151]](#footnote-152) The difference as a Schedule I poison was that the buyer had to sign a poisons book. As well as recording who was buying the product, signing the book was intended to emphasise to the user that they should take special care with the product.[[152]](#footnote-153) All of these supposed safeguards could be, and were, easily ignored by retailers, or circumvented by buyers, such as entering a false name into the Poisons Book.[[153]](#footnote-154) No matter how hard anyone wished, switching the focus from retailers to buyers and making them accountable for "every single drop"[[154]](#footnote-155) would be impossible. There was nothing beyond a person's conscience that would stop them from doing what they liked with the herbicide once they had bought it.

As we have seen, retailers were expected to prevent domestic users looking for paraquat from buying Gramoxone and to direct them to Weedol. It may have been relatively easy to identify those who genuinely needed Gramoxone for large scale herbicidal needs perhaps by the amount they required or how (and by whom) it was paid for, but it was impossible to tell who would cross the boundary between work and home and abstract some for domestic use. To clarify who was an appropriate prospective buyer, it was announced in 1974 that in addition to the Schedule I poisons procedures, prospective buyers of agricultural strength paraquat concentrates would need a certificate stating that they were entitled to buy poisons. Although, as "all householders are authorised to give certificates certifying a person to be one to whom a poison may properly be sold" according to Rule 36 of the Poisons Rules 1972,[[155]](#footnote-156) in reality this measure was only superficially stricter. How widely this was known is unclear, but it was definitely not included in the publicity heralding the change.[[156]](#footnote-157) Needless to say, this measure still did not resolve the problem of deliberate and accidental paraquat poisonings.

Media reports of fatal incidents, which for brevity and impact blurred the distinction between Weedol and Gramoxone, contributed to the use of both forms of paraquat as a poison being perpetuated. Readers wanted to know why garden columnist Roy Hay kept casually recommending a potentially lethal chemical to them, without ever mentioning risk.[[157]](#footnote-158) The columnist explained the existence of a domestic product which was much safer. As a model user, Hay was often imprecise: he usually simply said "paraquat" rather than specifying the brand name Weedol, he described the domestic version as "smaller packs" rather than less concentrated, and directed them to follow the manufacturers’ instructions. It is not surprising that some home gardeners were unclear about the relationship between the two products.

Additionally, ICI facilitated domestic users making a hazy distinction between the agricultural and domestic versions. When domestic users simply referred to using "paraquat" in the garden, they mirrored the lack of information about concentration that was apparent in the most publicly visible arenas: the Weedol adverts and packaging. While paraquat was never hidden as an ingredient; it was clearly visible in the adverts and on the packaging as the reason for choosing that product, the distinction between the concentrations meant for different user groups was not emphasised except in the warnings or admonishments which followed accidents. The general confusion about paraquat products continued into the 1980s, as illustrated by an exchange in the House of Lords, where Baroness Masham of Ilton asked why when she bought Weedol from her local shop, the retailer did not volunteer the information, nor know, that the product contained a poison. Her peers explained to her that the concentration of paraquat in Weedol was low enough that the amount contained in a retail unit would not, under normal use, constitute a poison threat.[[158]](#footnote-159)

## Advertising

On the whole, domestic users would have been highly unlikely to have encountered adverts for Gramoxone, although they may have seen it mentioned in profile-raising adverts from ICI. As well as being carried by different publications, sales adverts for Gramoxone and Weedol differed in both style and content, which emphasised the separation between the products and their intended users. Neither referred to the other brand, though they both highlighted paraquat as the active ingredient. Adverts depicted ICI's idealised professional and domestic users, and when compared side by side (something users were unlikely to have done) the differences between the two clearly clearly meant that the two audiences did not overlap. The professional user, the farmer, was pictured juxtaposed with a pastoral landscape, with the caption "ICI research pays off on your land".[[159]](#footnote-160) By contrast, the unskilled[[160]](#footnote-161) domestic user was shown wearing nice shoes, with a clean shirt and jumper in a much tamer setting, where an isolated shrub required their attention. It is easy to see how a small-holder would find this domestic setting and therefore Weedol irrelevant to their situation, identifying more strongly with the farm setting and therefore Gramoxone for their needs.

The agricultural and domestic user were imagined to have different motivations for using the product. They both wanted to kill weeds, but on different scales. The hardy farmers pictured in Gramoxone adverts were willing to try new things and take advantage of the latest agricultural grants to maximise his yields and profits.[[161]](#footnote-162) Domestic users did not have to be concerned with profit, what they were thought to be interested in was how paraquat could change their physical experience of the work involved in weeding. Adverts reassured domestic users that the product was harmless to users, other garden inhabitants and the soil, a statement that is likely to have directly addressed the anxiety around soils poisoned by DDT, written about by Rachel Carson. Conversely, adverts targeted to agricultural users did not talk about unharmed soil or safety.

The adverts for Weedol are summarised in Table 2 in order to highlight the key words that were used in the adverts and to see changes over time. General trends were that early Weedol adverts were more informative than later ones, as they were crafted to explain to potential users how Weedol worked, the scenarios that it should be deployed and what users could expect from it. As the product became better established and as advertising trends changed, less explanatory text was included in the advert, new users who had been primed by the eye-catching advert could scrutinise the packaging in store for more information about how and where to use it. Great pains were taken to put across the ease and simplicity of use, emphasising the use of the plants' own "natural" processes to kill the plant. Market research had suggested that potential users were needed reassurance about the immediate and long term effects on soil, animals and other garden users,[[162]](#footnote-163) and these aspects have certainly been addressed, especially in the earlier adverts.

Illustration 11: Advertisement for agricultural paraquat, placed in The Times, 1965

Illustration 12: Advert for domestic paraquat, placed in a variety of daily newspapers.

Although the rhetoric of weeding could be war-like, which invoked battles, domination and death, the language of Weedol adverts was restrained when it came to violence against weeds and instead focused on saving time and effort. While pictorial images of the user were masculine, advert readers of any gender were consistently addressed directly through the use of "you". The most common image that the user can relate to in these adverts, is of the packaging which they can find in their shop.

Weedol's adverts imagined users to be looking for particular assurances from the product, and the adverts consistently addressed these by emphasising the time saved,[[163]](#footnote-164) reduction of effort by switching “hard”[[164]](#footnote-165) or “back-breaking”[[165]](#footnote-166) work for faster and easier watering as well as “harmlessness” to anything other than weeds. An awareness that Weedol was perceived by users to be expensive, or at least that the cost had to be justified, also shows in the adverts. They detailed the precise area that can be treated,[[166]](#footnote-167) and consistently highlight the "low" costs involved, either of the product itself or of the specialised applicators (a substantial 22 shillings and sixpence,[[167]](#footnote-168) though later reduced to 15 shillings and sixpence) that would allow the herbicide's most economical application. This herbicide is associated with a certain level of disposable income so published prices also signal who the product is for and inform those who can't afford to use it what to aspire to. Throughout this chapter, we've seen that this information has been important to users of any garden chemical, as it also helps gardeners to plan how much they would need to buy, as well as to rationalise spending money on a task that could be done without any purchased products. Some gardeners wanted to use Weedol but not to invest in dedicated application equipment, so made do with items at hand, such as putting a large funnel over the watering-can rose to refine the spray accuracy.[[168]](#footnote-169)

From time to time the price of garden chemicals was discussed in the pages of gardening magazines. The staff were well versed in the reasons behind the "appearance" of the high cost, sometimes they even quoted the British Agrochemicals Association,[[169]](#footnote-170) or explained the development process.[[170]](#footnote-171) Home gardener Alf Prosser from Biggleswade had a letter printed in Practical Gardening, in which he noted his shock regarding the high prices of garden chemicals. He related it to the record number of people out of work in 1980, so were living on unemployment benefit and asked "How are these people supposed to afford such prices?". He declared that he would go back to hoeing his weeds. The editor responded that there had been a slow-down in price increases but referred to the cost of "all gardening necessities" as becoming prohibitive.[[171]](#footnote-172) As Alf demonstrated, herbicides are not necessary. This raises an interesting question of who garden chemicals are for and how they are used. While at first glance there may be more time for weeding when unemployed, that time is not leisure and it is rapidly used up looking for work, signing on, shopping around for better value expenditures on essential items, avoiding car ownership costs mean that travel will take up more time. Time squeezes like this may mean that low income gardeners or householders may be in even more need of chemical assistance than those who are better able to afford such labour saving purchases. However, garden chemicals are not produced or marketed with social responsibility in mind, no matter how the agricultural variants are promoted as working to improve productivity and lower food costs. New garden chemicals like paraquat were positioned as part of a lifestyle to aspire to, and they had significant costs associated with making them suitable for domestic consumers so even with two million people out of work in the early 1980s, prices could not have been reduced to allow unemployed people to afford them, no matter what disgruntled former users and sympathetic magazine editors said should happen.

The table also shows how different users, or at least potential purchasers, were reached through different papers. The Times rarely carried Weedol adverts, while they were carried much more frequently, were of greater variety and tended to be more richly detailed in the lower class daily papers. The focus on time saving and costs of material suggests that ICI knew that these were important to the majority of their users.

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| **Year** | **Advert** | **Paper** | **User image** | **Key phrases** | **Advertised Price** |
| 1965 | Ends the work of weeding | Express, Mirror | No user | Hard work, neutralised, harmless | 5/6 |
| 1966 | End the work of weeding | Express, Mirror, Mail | Hands, feet | Safely, harmless, easier, endless, economical, accurate | 5/6 (2 drum pack) 19/6 (8 drum) |
| 1967 | Don't waste time with weeds | Times, Express, Mirror, Mail | No user | Time, revolutionary, safely, save hours | 5/6 (2), 9/6 (4), 17/6 (8), 32/6 (16) |
| 1967 | My Dad's a Weedol weeder | Express, Mirror | Father (plus daughter) | Saves hours, kills, harmless | 5/6 (2), 9/6 (4), 17/6 (8), 32/6 (16) |
| 1968 | Stand up to weeds | Mirror, Mail | Male | Gardeners, revolutionary, kills harmless | 5/6 = 40 sq yds |
| 1969 | Block the living daylight out of weeds | Express, Mirror, Mail | No user | Low priced, harmless, unique, rain, time saved | Sprinkle bar 3/- applicator 15/6 |
| 1970 | [month]...in the garden with ICI | Mail, Express, Mirror | No user, but male tech advisor | Save hours of back breaking | ---- |
| 1970 | … without killing the soil or your back | Mail, Express, Mirror | Gloved hand | Backache, harmless, economical, ordinary, cost | Avg sized garden/yr 30 bob, 2 drum 5/6, money saving bulk |
| 1970 | Your garden pin up | Amateur Gardening Annual | Non-user woman | Easy |  |
| 1971 | Two ways | Mail, Express, Mirror | Male | Back-breaking, minutes, kill, harmless, cost | 40 sq yd = 30p |
| 1975 | … without killing the soil or your back | Mail, Express, Mirror | Male | Kill, safely, inactivated, economical, hours, back-breaking | ----- |
| 1977 | Fast and easy. | Mail, Express | Percy Thrower | Safely, backache | ---- |
| 1977 | ...plenty of help | Mail, Express | Percy Thrower | Compete, safely | ---- |
| 1978 | Stop weeds going to bed with your flowers | Mail | No user | Easy, kill, rain, effective | ---- |
| 1979 | Our weeders choice/ Weedol about it | Express, Mail, Guardian | No user | Kill, revolutionised, hours | ---- |
| 1980 | Don't let weeds be the first sign of spring | Times, Guardian | No user | Effective, speedy, inactivate | --- |
| 1981 | The British gardener's No.1 weedkiller | Mail | No user | Kill, harm, inactivated, risk, rain, gardeners | --- |
| 1984 | Weeds stop here | Mail | No user | Inexpensive, Care | --- |

Table 1: Table showing the Weedol advertising campaign key words. Decimalisation facilitated a price rise, with 30 pence being equivalent to 6 shillings, when previously the same pack to treat 40 square yards was slightly less expensive at 5/6.

Users were not always the main feature of Weedol adverts, and in the earliest adverts did not include an image of user at all, instead only picturing weeds around a rose bush.[[172]](#footnote-173) This demonstration of Weedol's "sensitive use" had been shown to be particularly appealing in market research,[[173]](#footnote-174) and would continue to be employed in advertisements that depicted Weedol use. The following season’s advert showed small illustrations of isolated parts of a user: hands, legs and feet, which although did not show a face, looked decidedly masculine.[[174]](#footnote-175) Disembodied limbs and photographs of users which did not show the user's face it perhaps made it easier for a wider range of advert viewers to imagine themselves in the role of Weedol user. Despite less physically able, retired people forming an ideal market as they in particular may find it difficult to bend to weed, the bodies of idealised users give no indication of this. Overtly positioning Weedol as for this use could make it less appealing to users who do not wish to think about this type of physical decline and loss of ability, even if it relates to a task they do not particular wish to do. It is hard to make solid statements of the adverts' intent as details do not appear to have been archived, but the results of some market research for Weedol show that the intended market was younger, middle aged gardeners rather than older ones.[[175]](#footnote-176) While the market research did explain why this segment was targeted, it may have been related to earning and disposable income, being accustomed to saving time through convenience products, as well as being open to new ideas, or at least not as habituated to the work involved in maintaining a garden.

In 1967, adverts featured an excited young girl pointing to a man declaring "My dad’s a Weedol weeder".[[176]](#footnote-177) The use of the weedkiller in close proximity to the child represents safety, although instructions on the packaging always exhorted the user to keep the chemical out of reach of children. In 1967 another advert ran simultaneously which did not show any user figures at all. 'Don’t waste time with weeds – water them away with Weedol'[[177]](#footnote-178) gave potential users a clear and catchy alliterative message about what the product was for, the benefit of saved time and how to use the weedkiller.

Illustration 13: My dad's a Weedol weeder! The tone was conversational and friendly, focussed on how the user could save time using safe Weedol.

Illustration 14: Stand up to weeds. All the other adverts have shown standing users, but this one makes a point of it. The user has a relaxed posture as he applies Weedol, although the work of weeding has not completely been eliminated, it no longer involves grubbing about.

The "Stand up to weeds!" advert was first placed in mid-April 1968, again only showing the lower half of a male user in neat trousers and a shirt, standing with a hand on his hip and holding a watering can with which to apply weedkiller.[[178]](#footnote-179) The wording implies both the physical action of weeding, which with Weedol no longer involves bending or kneeling, as well as overcoming the relentless invasion of weeds in ones' garden. The practical poses that featured in Weedol adverts are in themselves masculine, they are not decorative or in anyway defying gravity in an unfeasibly unstable manner. which is often how women are illustrated or posed in advertisements for products, a subject that historian of advertising Roland Marchand has explored in depth.[[179]](#footnote-180) If we take Zayer's typologies of masculinity depicted in advertising, the men shown in these advertisements are not adventurers, athletes, attractive, strong, wanting to stand out as individuals, daredevils, partiers or players. It would be unfair to categorise them as slobs (out of shape and unattractive) though resorting to a labour saving device could be seen as avoiding physical exertion, leaving the most appropriate typologies as goal-driven (determined and motivated to destroy weeds), and family men (working at home).[[180]](#footnote-181)

In 1970, a whole user was depicted for the first time, and compared to a ridiculously exaggerated non-user (illustration 12).The user was a middle aged man, most likely in his own garden, where he used it among flowers and shrubs, not to clear expanses of weeds or in paving. Through his casual clothes, his relaxed, upright stance and smoking a pipe, his appearance suggested leisure. The dress and actions of the gardener using Weedol in these adverts communicate how easy and clean using the product was. If Weedol was not available, meaning they had to manually weed instead, they would have to wear clothes that could get grass stains and mud on them, so the pale cable knit jumper, the white shirt cuffs show how mess is avoided. The presence of the pipe indicates masculinity,that he has disposable income to essentially burn, that he is unhurried and at leisure,[[181]](#footnote-182) but also that Weedol is safe to use. If the user had to weigh out the chemical, they risked getting it on their hands then transferring it to the pipe and from there into their mouths. Dissolving Weedol directly in a watering can or spray cannister avoided this contamination problem. Perhaps these men would have been less used to handling potentially dangerous chemicals in the home, leaving that task to their wives. Perhaps the comfort of home, and a mindset unique to leisurely activities, meant that vigilance and care that men might have applied to handling dangerous substances in their working lives was abandoned once in the domestic environment.

Remaining on the significance of the pipe, historian of advertising Marchand suggests that this communicates tradition and is the antithesis of modernity.[[182]](#footnote-183) Although this interpretation may not have been intended by the ad's creators, it may simply have been a habit they associated with being outside and gardening, by focusing on these conservative traditions the message could be viewed as reassuring the user that although they are buying into the chemical revolution through the most recently developed and modern herbicides, it does not mean any other alarming changes. Although claims were made on the packaging of Weedol for paraquat's position in the revolution of weeding, the adverts do not attempt to depict anything chemical, revolutionary or ultramodern, instead the very ordinary images work to normalise chemical use, that it was nothing unusual, that gardening was still very much a leisurely activity.

Illustration 15: Two Ways to Weed. The dishevelled figure is contrasted with a man at leisure, the hand in pocket stance is repeated from Stand Up to Weeds.

The visual trope of hand in a pocket signifying ease and leisure was picked up on by an artist for woman's magazine Good Housekeeping when they illustrated an article on choosing and using weedkillers. Her glasses were specifically pointed out as a protective measure, to protect her eyes from any wayward droplets,[[183]](#footnote-184) her apron was not commented on. That it was left to magazines to translate the use of Weedol to women does not mean that women did not already choose or use this product, but it is interesting simply because of the absence of women and femininity from Weedol adverts.

Illustration 16: Waging War on Weeds: a profoundly peaceful image of the war in this garden. The container beside her is not for domestic Weedol, it looks awfully like one for non-domestic Gramoxone.

When ICI did feature a woman in their garden chemical advert it was in 1970's "Your garden pin-up"[[184]](#footnote-185) which depicted a simpering woman holding a parasol next to a lush, flowering border, with a variety of ICI garden chemicals at her feet, including "great easy to use" Weedol. The advert described its function as "To remind you, in the nicest possible way, that ICI make a complete range of products to make your garden look lovely". Pin-ups are generally for the benefit of men, which indicates that the imagined gardeners and chemical users were men. However, compared to other adverts for consumer products in the late 1960s and 70s, this incarnation of a pin-up was quite tame. Still though, the woman was not obviously the person who used any of the products and men continued to be addressed through ICI's adverts as the chemical using audience.

Competition for resources (soil nutrients, water, light) is a major reason for weeding, not just that weeds can look untidy. Competition for water in times of drought was especially important and in 1976 the UK experienced the hottest and driest summer in 350 years. However, ICI did not create a new campaign capitalising on this, possibly to avoid criticism about using water on weeds during a time of scarcity, though apparently not concerned enough about that charge suspend advertising as they continued to run "Don't waste time with weeds". A couple of years later, space was the resource competed for in the innuendo-laden tagline "Stop weeds going to bed with your flowers"[[185]](#footnote-186) which placed the gardener in a protective role against the invasion of weeds into the flower bed. "Block the living daylight" plays on the action of the chemical, to disrupt photosynthesis, as well as the phrase to knock the daylight out of something.

The next illustration shows the instructions on the outside of the Weedol packet, where we can see that natural processes and harmlessness are highlighted. In the depiction of Weedol application, birds and insects are also shown, signalling that Weedol could be used without harm to wildlife.

Illustration 17: Instructions on the back of Weedol packet (1976). This serves as an "at a glance" list of safety precautions, and explanations that could help a purchase decide on this product.

Illustration 18: Weedol kills weeds without killing your back. The leisurely gardener from the Two Ways advert has been illustrated here.

ICI even featured a celebrity paraquat user, Percy Thrower, in some of their adverts.[[186]](#footnote-187) Thrower had been a household name since 1947, when he started giving gardening advice on BBC radio. His columns on the subject appeared in the Daily Mail, the Mirror and the magazine *Amateur Gardening*, he published books, as well as being lead presenter on the BBC television show *Gardeners World* and appeared on children's programme *Blue Peter*. Thrower embraced the range of ready-made chemical aids, although this enthusiasm was one of the factors in his parting company with *Gardeners World* in 1976.[[187]](#footnote-188) However, Peter Seabrook the presenter who took Thrower's place, suggested it was the TV adverts for ICI products that aired on rival broadcast channel ITV which was the step too far.[[188]](#footnote-189) When ICI incorporated Percy Thrower's image and a testimonial from this high profile, knowledgeable and trusted gardener, they aimed to capitalise on Thrower's "brand". I would describe Thrower as a model user, but not the only one, as other garden writers and broadcasters also performed this role.

The model user could also counter accusations that Weedol was expensive, by reiterating that by investing in the appropriate application spray bar, the herbicide could be applied without waste as the dedicated applicator could make Weedol go even further.[[189]](#footnote-190) Model users were by no means perfect, shown through inconsistent product placement, or the occasional modelling of unideal opinions such as that "amateur packs were expensive".[[190]](#footnote-191) Columnists offered paraquat as an option for other home gardeners, even when closer reading of descriptions of their own gardens and practices showed that they chose not to use paraquat in as many situations as they suggested. Some preferred to use cover planting to avoid weeding in their own gardens, limiting the amount of bare soil that could be colonised by weeds.[[191]](#footnote-192) Paraquat could play a part in preparing the soil for the desired plants, but it was not the kind of frequent application that ICI had envisaged. However, for many of their readers in the early 1970s, this aesthetic was alien and messy. Gardeners were used to hoeing and digging to remove weeds, although disturbing the soil like this brought weed seeds to the surface to germinate. Using Weedol while the weed seedlings were tiny would ensure that the resulting dead material would quickly degrade and dissolve away. Weedol was a chemical hoe, meant for targeting seedlings rather than visible, graspable weeds. Using the chemical on larger weeds did not give such satisfactory results, leaving a desiccated, dead plant which would then have to be pulled out, inevitably disturbing the soil and encouraging new weed growth.[[192]](#footnote-193)

Home gardeners were educated about the correct use of paraquat and Weedol through the advertisements and promotional articles on gardening. None of the adverts shied away from the mundanity of applying weedkiller, no fantastical situations were dreamt up, the power and dominance of the user over weeds was kept low-key. Also significantly, the stereotypical hapless male does not feature as he might if this was a product for use inside the home. It would not be fitting for "the horse's ass"[[193]](#footnote-194) to model anything less than responsible chemical handling for a product that is meant to kill. The models employed by the advertising agency to portray gardeners would not be employed to promote underwear, or fast cars; he is paunchy, conservative and a home-oriented family man. He's capable, likes the (domesticated) outdoors but is not a rugged, macho character.

**Disobedient or Careless Users**

With so many examples of careful and correct use to guide the application of paraquat in their gardens, we must now address how paraquat came to be known as a killer chemical. Indeed, the application was generally not the problem, but straightforward misuse, especially regarding storage, which itself was not modelled through adverts but relied on common sense which was reiterated in the on-pack instructions. The darker side of paraquat's story will be examined through the disobedient users. What should be remembered is that the majority of users were obedient, they carefully followed the instructions for normal, expected uses and neither they, nor anyone else, came to any harm. Typically, a disobedient user of Gramoxone contained it in an unlabelled or inadequately drinks bottle and allowed it into a domestic environment. There might be confusion or disagreement about what constituted safe storage, as there was in Roy and Sheila Sheldon's household where the bottle was stored in the pantry as a safer option than the garage, where it was thought to be a danger to the cat.[[194]](#footnote-195) A disobedient domestic user of Weedol would not store it in a safe place, they would allow children access to the granules, dissolve granules to make up a solution concentration different to those recommended by ICI, or use the herbicide for purposes other than killing weeds in their garden.

There were plenty of instances of experienced agricultural workers who handled Gramoxone irresponsibly,[[195]](#footnote-196) with an industrial hygienist going so far as to declare farmworkers as “notoriously careless”.[[196]](#footnote-197) This jars with the concept of agricultural workers as skilled, trusted and responsible handlers of agrochemicals that we saw put forward by the regulatory boards associated with the PSPS procedure. Injuries to the skin and eyes were caused by careless handling of the caustic concentrate, or a tardy response to becoming wetted by the diluted chemical. In these ways harm was restricted to the user, but if the result of disobedient use was to repack the chemical into a bottle, the consequences could extend beyond the worker themselves when they took that container into a domestic location, where it could have a fatal outcome.

General description of a poisoning

Once inside an unlabelled, reused bottle, the herbicide could be given another identity by an unsuspecting, unintended user. The familiar shapes of drinks bottles, an important part of their brand identity, sent out the wrong signals about safe contents when they were reused to store agrochemicals. The bottles of concentrated herbicide found their way into bags,[[197]](#footnote-198) glove compartments,[[198]](#footnote-199) sheds,[[199]](#footnote-200) and kitchens[[200]](#footnote-201) where they were mistaken for dark coloured drinks: cordial,[[201]](#footnote-202) dandelion and burdock,[[202]](#footnote-203) cola,[[203]](#footnote-204) beer,[[204]](#footnote-205) wine,[[205]](#footnote-206) or sherry[[206]](#footnote-207)then swigged by curious or thirsty children, teens and adults, with very serious and sad consequences. A mouthful could be lethal, even if it was spat out.[[207]](#footnote-208)

Despite being corrosive, when swallowed paraquat did not burn immediately instead irritating and ulcerating the mouth and throat after a period of time. When first marketed, paraquat products did not necessarily cause vomiting, although it had been judged to be unpalatable, but how this conclusion was reached is unclear. After being absorbed into the bloodstream, paraquat caused damage in the kidneys and the liver. What surprised doctors who treated the first poisonings, not to mention all those who had been involved in examining the chemical's risks and hazards, was that paraquat had a peculiar effect on lung tissue. It irritated and thickened the membranes that gas exchange occurs across, which reduced the efficiency of the organ, but also caused cell proliferation (a repair response) in the lungs, so much so that the lungs solidified. Research at ICI's Central Toxicology Laboratory eventually showed that paraquat reacted with a cellular transport process in the lungs, causing this characteristic damage.[[208]](#footnote-209)

The novel features of paraquat weedkiller poisoning caused consternation, and medics were urged to extract further information regarding the type of weedkiller their patients had ingested, as no longer could they assume a weedkiller admission to equate to relatively familiar, arsenic-based herbicides. Despite doctors’ best efforts to deactivate paraquat with Fullers earth, or kaolin, which mimicked the chemical's deactivation seen in soils,[[209]](#footnote-210) or to dilute the chemical in the bloodstream through forced diuresis as was employed in treating barbiturate overdoses,[[210]](#footnote-211) their treatments were experimental and often unsuccessful. In some cases they even worsened the situation, although this eventually provided evidence which increased understanding of paraquat's mechanism of action.[[211]](#footnote-212) Gramoxone poisonings led to a horrifyingly certain and slow death, potentially over two weeks or more. Even in the 1980s after extensive, well communicated experiences of treating paraquat poisoning including some successful recoveries, the advice was to focus on palliative care, supporting the patient and their family towards the end of life.[[212]](#footnote-213)

This aspect of suffering was central to the mainstream media coverage of accidental Gramoxone poisonings, which only started appearing as news items in their own right in 1968 although as we have seen already, accidents had happened earlier. The stories invariably conveyed the lack of effective treatment available, often with the stock phrase "no known antidote". As father of paraquat Bill Boon wearily noted, this antidote statement was technically accurate, but it was not unusual as in the true sense of antidote where one chemical neutralises another, very few poisons have an antidote, not even aspirin. Boon attributed the origins of this phrase to an answer given to a coroner in court to the question whether an antidote was available.[[213]](#footnote-214) However, it grabbed attention and was useful shorthand in newspapers for expressing the horror and despair that was experienced by victims, their families, and the medics who cared for them.

Earlier we considered the instruction for safe use and storage of Gramoxone, that it must be kept in its original container and not repacked into unlabelled bottles. Some retailers broke their agreement with ICI, then the Poisons Rules, if they sold Gramoxone in other bottles but often having a bottle of Gramoxone was associated with workplace theft.[[214]](#footnote-215) In 1968, 6 year old Beverley Pollitt died after she drank Gramoxone from a lemonade bottle at home. Her father worked for ICI and had asked another ICI laboratory worker with access to Gramoxone, to get some for him.[[215]](#footnote-216) The liberation of paraquat formulations from the ICI plant was not uncommon: it "leaked out of the plant like water off a roof" according to someone who did not have any connections with the plant, other than living in the area.[[216]](#footnote-217)

None of the other reported cases of accidental poisoning were linked so closely to the chemical company and or hinted at any repercussions for the supplier of the chemical. Yet there were numerous poisonings that occurred because people stored small quantities of the weedkiller in bottles at home. MAFF described people who brought home Gramoxone as trying to avoid the expense of buying Weedol.[[217]](#footnote-218) Market research revealed that from the start, potential users expected the price for such a product to be between 3/7 – 4/- rather than the maximum recommended retail price of 5/6.[[218]](#footnote-219) In table 2, we saw that this advertised price of Weedol remained remarkably stable over time, which reflected the need to recoup the costs of development and manufacturing, but may have frustrated and even deterred some would-be users.[[219]](#footnote-220) Early on in Weedol's provisional commercial clearance the PSPS expert groups had identified the high cost of Weedol had been identified as a potential push factor for some users towards the cheaper Gramoxone, and the likelihood that it would be stored inappropriately.[[220]](#footnote-221) No change in the price of Weedol spurred an investigative journalist to calculate that the domestic product was eight times more expensive than Gramoxone, who suggested that reducing the cost of Weedol would prevent people from decanting the herbicide and bringing it home.[[221]](#footnote-222)

The financial cost may have motivated some workers to abstract samples of weedkiller for home use, but stealing from work is not necessarily about cost, as demonstrated by low cost pens and other stationery taken from office jobs. It may be the only kind of perk a person at the bottom of the hierarchy can extract, so reducing the perceived price differential between Gramoxone and Weedol may not have had such a large impact as some people may still have considered work a source of free herbicide, which they could generously redistribute. From the circumstances reported in newspapers, liquid paraquat preparations tended to be brought home by quite young men, who worked in agricultural or horticultural jobs or were in social circles with people who could access the high concentration product.[[222]](#footnote-223) Having said this, accidental poisonings were not restricted to young men, demonstrated by the cases of a 44 year old prison officer who kept Gramoxone in an aftershave bottle in the shed,[[223]](#footnote-224) and a couple who, the paper noted had been married 48, years kept industrial strength herbicide in an old sherry bottle.[[224]](#footnote-225) Reporting these accidents formed part of the informal education of newspaper readers, informing them that all sorts of people including people just like them, could make poor choices that went against common sense.

The lack of respect for paraquat's strength demonstrated by those who inadequately stored the chemical, may have been influenced through the choices of words used on Gramoxone's labelling, which prompted the NFU to call for greater emphasis on its dangers.[[225]](#footnote-226) However, no matter which words, whether "caution" or "poison", were employed on the label, the reception of them depended on the user. If they did notice and read the label, a user who was trained to use the chemical at work may well have believed themselves competent to use the same product at home. Where the problem lay was in the presence of other people in their domestic environment who could not be expected to know what the liquid was or the warnings that accompanied the herbicide in its original packaging.

The story of 15 year old Alex Smith's accidental paraquat poisoning in 1968 is one of a teenager exploring his father's shed. Mr Smith was a haulage contractor, who had obtained the weedkiller through an allotment association. Alex found what he believed to be a bottle of soft drink, and drank it. The incident was fairly widely reported on, but the weedkiller was not the focus. Alex became Europe's first lung transplant patient, and although this was the first paraquat poisoning to gain such a high level of coverage the chemical was never named as such, only described in a ways that would later become typical for paraquat poisonings, including the description that it "looked like cola" and the devastating effects on the lungs.[[226]](#footnote-227) [[227]](#footnote-228) Mr Smith senior featured in photographs with his son, but his role in the accident was not discussed. Alex's character was commented on positively, fitting his status as brave patient involved in a risky and pioneering operation. He was pictured cheerily sitting in his hospital bed[[228]](#footnote-229) and described as having "no previous significant history ... a well-balanced, intelligent, and stoic individual"[[229]](#footnote-230) This highlighted how the accident could happen to anyone, which was a departure from the private list of poisonings occurring in 1966 and 1967 compiled by PPL and ICI representatives. The Irish and Scottish incidents were described in a way that emphasised poor or defective character of the unfortunate misuser, "patient was drunk when he consumed the chemical" and "a mentally retarded man drank Gramoxone in mistake for wine" as well as the explicitly prohibited behaviour, repacking into beer bottles, and storing them among other drinks.[[230]](#footnote-231)

Those who disobeyed the instruction to never repack Gramoxone, and kept the herbicide in reused bottles at home were publicly condemned by authority figures. Where Gramoxone was sold to an amateur gardener which resulted in a fatal poisoning, an ICI representative criticised the vendor as "silly and irresponsible".[[231]](#footnote-232) ICI's Bill Boon, champion of paraquat, was reported as attributing accidental deaths to "human stupidity".[[232]](#footnote-233) Keeping Gramoxone in unmarked, reused bottles was "asking for it" coroner Donal Summerfield said.[[233]](#footnote-234) Coroner Roger Stokes was gave good copy when he described the "monumental folly" and "disgraceful act of carelessness" that putting weedkiller in "tempting bottles" was, and compared it to "putting fireworks in a box labelled baby powder."[[234]](#footnote-235) As poisonings of this type accumulated, another coroner frustratedly asked "when will the public learn?",[[235]](#footnote-236) but the reporters did not expand on or further investigate the subject of those who chose to use Gramoxone at home.

Despite accidental deaths among people of all ages, it was perceived that children were most at risk. A discussion on paraquat in *Handyman Which?*, a publication which addressed both DIY-ers and professionals, pointed out that Gramoxone was "one of the main poisons which kill children under 5 in this country" behind pharmaceuticals.[[236]](#footnote-237) Worded like this, it sounded shocking, but the actual incidence of paraquat poisoning, in fact with any household or garden chemical, was very low, especially compared to the greater number of instances of poisoning with prescribed and over the counter drugs.

This section has focused exclusively on accidents involving Gramoxone, which was never intended to be used domestically. Dissolving Weedol granules directly in a watering can to make a small amount was specifically designed to result in fewer opportunities for storing in bottles or mistaken identity and ingestion. The consequences of clumsily handling the low concentration granules were less severe than if the strong Gramoxone liquid was mishandled. From Weedol's launch in 1965 to May 1967, 7 million units were sold, in which there were five medical incidents reported associated with normal use. Only one was a poisoning, where a child “who should not have access to the preparation” ate the granules, and the others were skin irritation due to "carelessness". Considering the volume sold, this is a tribute to how safe the granulated product could be.[[237]](#footnote-238) Even in these cases, gardeners who had experienced negative health effects were reported to have carried on using the product.[[238]](#footnote-239)

### For use only as a herbicide

Another form of disobedience was to go against the instruction that it was only to be used as a herbicide. An example of this was using the product as an insecticide,[[239]](#footnote-240) not only was it ineffective as an insecticide and harmed the plants, when used in a confined space as a fumigant paraquat was fatal for the user. Thankfully, this was not a regular misuse but it was one that ICI representatives took upon themselves to address through firmly worded letters published in the national press. These attempted to educate people about the correct users and uses for Gramoxone, as separate from the users and uses of Weedol. Somewhat unsympathetically, the misusers were held up as misguided, using the product for something that it was clearly not intended, and their own harm followed logically.[[240]](#footnote-241)

Deliberate harm to oneself or another person using both Gramoxone and Weedol also occurred, through disobeying the advice that the herbicide was "not to be taken". Paraquat was not a special case among weedkillers, as we have already seen that suicide using this type of product was already an established practice. This use emerged quickly after paraquat was first marketed, even before accidental poisonings occurred. Gramoxone was implicated in suicide from 1966 and three suicides were attempted using Weedol, despite the fact that it was heavily advertised as "harmless" between 1966 and 1967.[[241]](#footnote-242) These Weedol attempts occurred before any publicity about the fatal outcome of Gramoxone misuse, sadly validating the predictions we saw made earlier by chemical industry representatives that someone would try to harm themselves. Although it was possible to deliberately ingest enough Weedol and behave in ways to result in a fatal outcome,[[242]](#footnote-243) the domestic paraquat product mainly featured in self-poisonings as an expression of distress, rather than intent to end life.[[243]](#footnote-244)

Although the medical press carried case studies of paraquat suicides from the earliest occasions, this use for paraquat was not explicitly mentioned in the mainstream press until 1972.[[244]](#footnote-245) This followed an investigation earlier in the year into how easily anyone could obtain Gramoxone.[[245]](#footnote-246) As an agrochemical, it might be expected that most of these incidents involved farmers or other workers with easy access to the herbicide but in around half the number of deliberate self-poisonings involving Gramoxone, the people had obtained it by either asking a friend or relative, or bought it openly. Many more men than women poisoned themselves, reflecting not only the higher suicide rate among men than women but also the gender balance of occupations that legitimately used paraquat concentrates and perhaps who would use weedkiller at home as well. Paraquat poisonings had a seasonal peak (May to July), which is when the herbicide could be expected to be used domestically and therefore readily available.[[246]](#footnote-247)

In 1973 Dr Matthew of the Poisons Board blamed what he called "disproportionate" media coverage given to paraquat deaths for the fact that in Scotland, the number of accidental deaths from paraquat was overshadowed by the number of suicides with the chemical.[[247]](#footnote-248) The agonising decline of patients was described in any news article about the lethality of paraquat, communicating to would-be users that this was not an “easy way out”, even if it was certain. Perhaps in reporting how easy it was to obtain Gramoxone and what size dose resulted in death, media reports effectively put the idea into public circulation, validated it and perpetuated this misuse of paraquat. It is hard to know how many people bought paraquat specifically for that purpose, and how many used it because it was already available. While some farmers certainly did use it because it was there, paraquat's lethality extended beyond the circle of expected users.

### Murder

Murder through poisoning with paraquat was another misuse of the Gramoxone (but not Weedol), as until 1974 the herbicide did not have an especially offensive taste or smell,[[248]](#footnote-249) (although the manufacturers declared it unpalatable) so could it could surreptitiously administered in strongly flavoured food and drink without suspicion from taint or residue (arsenic left white powder in drinks and soups[[249]](#footnote-250)). The delayed, generic symptoms of paraquat poisoning did not necessarily initiate detailed chemical analysis of blood or urine to bring the poison to light, and a poisoner could feign ignorance in order to delay or withhold appropriate treatment, ensuring their success in terms of dispatch and remaining undetected.[[250]](#footnote-251)

In 1973 it became apparent that paraquat was being deliberately misused as a poison, when Shelia Sheldon accused her husband of poisoning her,[[251]](#footnote-252) then Jennifer Kenyon and David Roberts were charged with the murder of Keith Kenyon.[[252]](#footnote-253) In neither of these cases was Gramoxone legitimately obtained. The character of the paraquat misusers were described as adulterous, jealous men and women, in turbulent, unconventional relationships that made for grippingly sordid, salacious news. I say misusers, because not only was the poisoner themselves described in these terms, but their victim, the unwitting misuser of paraquat, also had these negative descriptions applied to them. Poisoning is often thought of as a method used predominantly by women as a method of despatch not reliant on physical strength,[[253]](#footnote-254) but in the cases reported on in the newspapers it was used about equally by men. This alignment of adultery and herbicide use highlighted the potential (if mild) sauciness of Weedol's 1978 slogan "Stop weeds going to bed with your flowers".[[254]](#footnote-255)

Despite journalists fascination with the complex personal relationships of paraquat poisoners, there was a subject on which the newspapers remained quiet. In two separate murder cases, the accused (and convicted) poisoners even stated that they had got the idea from a story in the newspaper.[[255]](#footnote-256) This raises an interesting question of responsibility for copy-cat behaviour triggering, which we saw blamed for the high number of paraquat suicides. Paraquat had moved from the confines of niche columns to the main body of newspapers, and most importantly, the information carried in all these articles centred on the harm that paraquat, specifically Gramoxone, could cause when misused, rather than the correct, safe use of the appropriate chemical. The graph in Figure 2 shows the frequency of reports in the Daily Mail on paraquat involved in accidents, murders and suicides. Visualising the frequency in this way suggests the level of public exposure to the concept of paraquat causing human death, it does not show separate incidents, as accidents might be reported as the outcome of a coroners report, or several articles might be associated with the same story, if for example the progress of a poisoning victim was followed, and murder trials provided regular opportunities for coverage. Suicides were comparatively rarely reported, so we cannot blame the media for glamorising this use. What the graph demonstrates is that as knowledge of paraquat ingestion being fatal became more widespread through the reporting of accidental poisoning, stories of intentional paraquat fatalities followed.

*Figure 2: Graph showing the focus on accidents, murder and suicide using paraquat weedkillers.*

Another example of the reach of paraquat misuse appeared when a Mrs B. Andrews recounted how her young granddaughter had written about using paraquat to poison her teacher for a school project entitled "The day we killed Sir".[[256]](#footnote-257) Paraquat as a poison had extended far beyond the intended agricultural and domestic users of paraquat and gained a sinister reputation, which meant that "as poisonous as paraquat at first (3)" even appeared as a crossword clue,[[257]](#footnote-258) and as a figure of speech.[[258]](#footnote-259)

### Fear and Disruption

Another manifestation of paraquat misuse was product tampering, carried out by extortionists and saboteurs who threatened unknown, random people with paraquat poisoning. Arguably, as this required access to products already in stores, or in distribution chains and therefore the adding the paraquat to the product did not take place at home, this might not be considered a true "domestic use". However, these examples provides an opportunity to consider the unwitting, or unintended domestic use, through consumption, of paraquat. In 1974 a man was jailed for attempting to blackmail the CocaCola company by threatening to put paraquat into 200 bottles of the beverage.[[259]](#footnote-260) In the approach to Christmas in 1982, the Animal Liberation Front warned that they had poisoned turkeys on sale in Harrods and Woolworths,[[260]](#footnote-261) as well as in several Bristol supermarkets and butchers.[[261]](#footnote-262)

Illustration 19: Keith Waite, British Cartoon Archive, University of Kent, Keith Waite, Daily Mirror, 17 December 1984

Political cartoonist Keith Waite made the story into the subject of one of his sketches, caricaturing the absurdist situation in his depiction of balaclava-clad terrorists from the ALF writing a shopping list at home (see illustration). Ultimately no paraquat was found in any meat, but the withdrawal of turkeys from sale, and the anxiety it caused customers show that the threats were taken seriously. Shoppers at Safeway supermarkets were the target of product tampering in 1981[[262]](#footnote-263) and 1987.[[263]](#footnote-264) In an attempt to deny the blackmailers the satisfaction of attention, a media blackout was imposed while the police and the supermarkets worked on the issue.[[264]](#footnote-265) The supermarket users were surprisingly tolerant of the risk, citing their prior experiences with bomb threats and explosions. Some declared that by continuing to shop there, they were defeating the extortionist’s aim of disruption. Shoppers also trusted the vigilance of supermarket employees and their own ability to spot tampered packaging.[[265]](#footnote-266) The blackmailer operating in 1974 was certainly at an advantage for novelty but that year a stenching agent was added to Gramoxone which could have tipped off recipients of their poisoned food. These events showed that like sodium chlorate, paraquat could be misused to terrorise people.

### Public Warnings about Paraquat

While threats of paraquat contamination could terrorise shoppers, paraquat's sinister reputation was elevated to people at home by public warnings in relation to loss or suspected theft of Gramoxone, as well as the normal application of paraquat. Police broadcast warnings with loudspeakers or went door to door to announce the presence of rogue paraquat, and therefore the possibility of a rogue (mis)user, in the residents' locality. Examples included containers going missing from the back of a truck,[[266]](#footnote-267) being stolen from a locked garage,[[267]](#footnote-268) and containers of paraquat swept overboard from a container ship and perhaps being found washed up on a beach.[[268]](#footnote-269) Local warnings were issued in cases of paraquat use demonstrating the fever pitch surrounding the dangers associated with paraquat, for instance a plant nursery sprayed their property and the spray drifted onto residents gardens,[[269]](#footnote-270) and yet another when a bramble patch was treated and children were discovered to have eaten the blackberries.[[270]](#footnote-271)

The possibility of large containers of concentrate being unaccounted for and in the hands of potential misusers, is understandably troubling, whereas warnings issued following the use of diluted paraquat seem to be an over-reaction, indicative of the media hysteria that anything paraquat related could cause. When diluted according to the instructions, the concentration would not be expected to be harmful to humans.[[271]](#footnote-272) Therefore, these warnings could have stirred up unnecessary alarm. Neither did this type of warning improve the distinction between agricultural and domestic products, or communicated the best practices of application, or the circumstances when it really was harmful. In the desire to protect the wider public through these dramatic methods, the warnings were potentially scaremongering for those who received them.

The Daily Mail took a particularly active role in educating readers about the dangers of paraquat, and routinely contacted the Home Office for the latest comment on regulation. Civil servants’ reactions to this show a mixture of relief that the paper was getting across information about storing chemicals safely and following instructions for safe use, in fact so effectively that civil servant R.A. Kendall wondered "whether there is much scope for useful Government publicity on top of all the educative publicity already given by the newspapers to paraquat accidents".[[272]](#footnote-273) This indicates that newspapers clearly were considered to play a large role in educating users and non-users about the existence of paraquat, as a weedkiller and a killer of humans.

This lack of accuracy by referring simply to the active chemical paraquat is hard to explain. Paraquat was only made by one company, ICI, so avoiding the brand name would not achieve the same level of anonymity as a product that was made by lots of different companies, as we saw with sodium chlorate, or to give another example, "bleach" as opposed to "Domestos". If the papers had been trying to avoid singling out an ICI product as related to horrific poisoning cases to protect themselves from being accused of tarnishing the company's reputation or campaigning against them, they were inconsistent. Newspapers were not the only way that people could learn about the chemical, so if they were sufficiently interested they could read the packaging in a store, look it up in an agrochemicals directory, write to the company, MAFF, or an expert magazine.

### Reassuring Users and Non Users

Occasionally domestic paraquat users had doubts about the consequences of their chemical use, and wrote to MAFF seeking reassurance. One such user was Mr Oliver, who killed off the grasses in his asparagus and mint beds with "paraquet" but after reading Rachel Carson's *Silent Spring* felt apprehensive about eating the produce that his work would yield next spring.[[273]](#footnote-274) The MAFF representatives reassured Mr Oliver by referring him back to the company's information about paraquat, specifically Weedol, because as a home gardener this was what Mr Oliver should have used, and reiterated the sentiment that paraquat did not persist in soil and Ms Carson was writing about a quite different chemical.[[274]](#footnote-275) There are not many exchanges like this preserved in the archives, but where they appear, they illuminate the social influences on chemical users, and who gardeners felt they could trust for information. By seeking reassurance from MAFF, who provided a personalised letter, not a standard response, it shows that this gardener at least, knew which authority was looking out for his interests and could approach them.

A less personal method of reassurance were the profile boosting adverts which were a staple feature of ICI's communication with the general public about their work and public relations for the chemical industry in general.[[275]](#footnote-276) ICI used these adverts to assert to users and non-users that ICI products were of great benefit to their quality of everyday life. When Gramoxone was first launched, ICI's promised that paraquat would boost the nation's total area of agriculturally productive land, improving Britain's self sufficiency regarding its food supply, and when paraquat was exported, it was set to guarantee riches to the UK's chemical industry. In post-war Britain which was rebuilding its economy and anxious about reliance on imports, this was an encouraging message.

Later, as paraquat poisonings accumulated and the United Kingdom suffered in a recession in the 1970s, ICI ran a series of half page adverts to demonstrate the company's contributions to everyday life and the British economy. "Ideas in Action from ICI" (1974) showcased three of their revolutionary products, with Gramoxone listed alongside, and therefore as equally beneficial as"Halodane, the world's most widely used anaesthetic" and BCF liquified gas to put out fires "saving precious seconds, precious lives." In these adverts, their message was summed up "Changes for the better, world wide". In addition, ICI spelled out how much money the company was making, investing and recirculating through using "35 000 suppliers" in the UK, very much effort to show the importance of the company when the country was in recession.

This profile raising activity ran for the duration of nearly two weeks of daily court reports of the first murder case involving Gramoxone poisoning. I wonder if this was a deliberate exercise in damage limitation, in which they aimed to reinforce the positive benefits brought by paraquat when properly used. This tactic is only successful where people pay attention to advertisements, which in this case was not measured by the company. This public relations exercise did not extend to encouraging newspapers to expand on the social usefulness of paraquat, although articles concerning the murder trial did contain information about the proper segregation of Gramoxone as only for professional use.

## Preventing Misuse

As poisoning cases accumulated, media attention both exacerbated the problem by providing would-be misusers with very detailed information, as well as ameliorating the issue by educating people about how such chemicals should be stored safely and ought to be used according to manufacturers instructions. In addition to this, a variety of other solutions were proposed to avoid poisonings.

Restricting availability of drinks bottles

An alternative approach suggested by Scottish Medical Officer of Health (MOH) involved criminalising individuals who used soft drink bottles for the storage of anything other than soft drinks, through the amendment of the Soft Drinks Regulations.[[276]](#footnote-277) In the 1960s cash deposits on glass bottles caused the MOH concern that bottles which had been used to store noxious household or garden chemicals would then be returned tainted with residue.[[277]](#footnote-278) However, this was considered unnecessary by at those in London, as the Poisons Law already covered this the sale of poisons, but that it would be impossible to control how people use bottles.[[278]](#footnote-279) Even though the aim of eliminating accidental poisonings is honourable, administering and enforcing any such scheme would be cumbersome as well as ineffectual. If mystery poisonings traceable to bottles which had been through the returns system had not been a noticeable problem before paraquat, then fears of residue contamination would not have been something to worry about.

Buying only what you need

Although general advice to gardeners using chemicals in their garden was to buy chemicals only when needed and use them up to avoid storing chemicals and remove the possibility of accidental poisoning,[[279]](#footnote-280) this recommendation was perhaps undermined by special price offers on garden chemicals, including Weedol. Price reductions run by both ICI and individual retailers as part of wider seasonal promotions, as well as to promote the new formulation which contained diquat, but the discounts also be seen as a response to claims made by gardeners that they found the high prices of garden chemicals a deterrent to using them. Although people could buy what they required at this lower price, it could provide temptation to stock up and therefore store the product, making it available in the household for unintended users, and uses.

Changes to formulation

When domestic users were assumed by experts on the PSPS committees to be incompetent to handle a concentrated liquid, the problem they considered was splashes and spills of a caustic substance, not accidental consumption. When it appeared that amateur gardeners did want to use highly effective, revolutionary Gramoxone, rather than tame, expensive Weedol, and so they illicitly decanted the concentrate into an inappropriately labeled bottle, the suggestion that ICI should offer small bottles of Gramoxone in order to reduce accidental poisoning seemed to make sense.[[280]](#footnote-281) While this might have eliminated mistaken identity, smaller bottles as were sold in Japan where most farmers operated on a scale that demanded this change, turned out to be almost an invitation to suicide.[[281]](#footnote-282) Despite the reported problems of home Gramoxone use all relating to consumption, there was no serious discussion of granulating the industrial strength herbicide. ICI's revolutionary new system of agriculture was reliant on new equipment to apply liquid rather than powders or prills, so farmers worldwide were locked in to a mode of delivery that demanded liquid, where the consequences of an incompletely dissolved particle blocking a sprayer were far more infuriating and expensive than an amateur gardener's blocked a sprinkler bar on a watering can. Farmers' investment in equipment meant that Gramoxone could not be reformulated to a far bulkier and more awkward, but safer solid. Therefore, ICI's research into making the liquid formulation thicker, so it would be harder to swallow, or into a jelly-like formula can be seen as attempting to work out a compromise that could accommodate their professional and amateur paraquat users.[[282]](#footnote-283) I strongly suspect that if a Gramoxone jelly had been marketed, it would have shifted the problem from bottles to those other readily available domestic containers, jars.

Although it had been suggested that certain poisons be highly coloured, this most often related to how white powders were sold by pharmacists and mistakes made with their storage and labelling, rather than for consumer-ready products. ICI had been extremely resistant to requests that the labelling move beyond "Caution", so to include precautionary measures from the very beginning would have have signalled that they expected there to be trouble. Ultimately, although the very small minority of misusers were predictable, their actions were hard to control. The relatively low incidence of serious misuse, despite its high profile, and the utility of the agrochemical meant that the majority of obedient users outweighed the misusers.

Although company and MAFF representatives put full responsibility for accidents on the chemical users, and insisted that when the instructions were followed paraquat was safe, it would have been a public relations disaster for ICI if they could not be shown to have responded with some positive actions. Company spokespeople were readily contactable by journalists, who were able to portray the chemical company positively, as working hard to make the formulation of the very effective and valuable herbicide safer, and investing in research to find better treatments for poisoning.[[283]](#footnote-284)

Despite reservations that “those who drank paraquat in mistake for something else tended in any case to swig their drink back, without stopping to savour the bouquet"[[284]](#footnote-285) the addition of a stenching agent was one of the first changes to Gramoxone's formulation, despite initial concerns that it would affect the herbicidal efficacy. The off-putting smell was expected to alert the user to the noxious nature of liquid and prevent poisoning through mistake identity. If the stenching agent had not deterred the drinker, another line of protection was later added in the form of another ICI discovery, a triazolopyridine referred to as PP-797 made by FL Rose and colleagues. From 1977 PP-796 was added to both Weedol and Gramoxone to make people vomit and reduce the amount of paraquat that could be absorbed.[[285]](#footnote-286) From 1980 Bitrex, as an increasingly prevalent and high profile[[286]](#footnote-287) proprietary additive in a variety of household chemicals, so had been publicly raised as an option for making paraquat preparations safer. However, ICI decided against including it as paraquat was already unpalatable, so Bitrex, which they would have to licence or buy at additional cost, would not make their products any safer to use.

The issue of Gramoxone being mistaken for dark coloured drinks presented a target for change. In a parliamentary debate on the Farm and Garden Chemicals Act, it was proposed that manufacturers of any garden chemical should strongly consider the appearance of their products, using the example of Gramoxone's visual similarity to cola.[[287]](#footnote-288) This echoed old arguments about colouring poisonous chemicals, for instance giving normally white arsenic and strychnine formulations unmistakably vivid colours in order to avoid accidental poisoning.[[288]](#footnote-289) However, in the case of Gramoxone which was a dark liquid, it was much harder to add a colour that would stand out and was not achieved.

### After paraquat

Following the drama of paraquat poisonings in the preceding years, new garden weedkillers were put onto the market with the specific claim that they did not contain paraquat. This can be interpreted as a reaction against the perceived danger of paraquat and fulfilling a desire among gardeners for an alternative product, and we can see a parallel with the adverts for products in the 1930s that stated that they were as effective as arsenic but not poisonous. In 1981weedkillers named DeeWeed and Leroco were advertised with the claim that they did not contain paraquat or sodium chlorate. The fact that the effect would last at least 3 years indicates that it would not be a direct competitor to paraquat, but the assertion that it is neither of these well known chemicals is striking.[[289]](#footnote-290)

These products were more likely to have been designed to cater for the user keen to keep a low maintenance patio or drive weed-free, "property owners" were addressed, not the gardeners that Weedol targeted. By the nature of the type of gardening featured in Weedol adverts, the sensitive removal of weeds from rose gardens, flower beds and vegetable plots, a degree of long-term investment in the activity is supposed, which means that those at least some of the those same gardeners are likely to be property owners too. Addressing "property owners" excludes tenants, who may also be keen to keep the outside areas of the property they inhabit tidy, but maybe this presumed economically lowly group of renters are not seen as reliable enough either weed regularly or handle chemical weedkillers.

Thanks to paraquat's inactivation by soil and gardeners weed killing situations continued to call for a contact herbicide, where gardeners could rely on the soil being suitable to plant in immediately Weedol was not immediately displaced from its position in the market and continued to be available. It also shows that a significant majority of users who bought and used the herbicide were not shaken by the negative publicity that paraquat as an active ingredient received. ICI had been able to reassure users that they were concerned about consumer welfare by changing the formula, as well as by being active in understanding paraquat poisoning and developing treatments for poisoning victims. The amount of paraquat in Weedol was reduced by replacing half with diquat, but because of the niche it occupied when considered how it would be used in the garden, it would only be displaced when a product that could be used in similar circumstances was available.

The evident demand from users for a herbicide that would break down rapidly in the soil paved the way for glyphosate. Glyphosate's arrival on the market spelled the end for paraquat, as it was extremely effective in situations where paraquat had previously been the best choice, it broke down quickly and apparently harmlessly in the environment, plus it was not tainted with the traumatic deaths that paraquat was associated with. Glyphosate products from large chemical companies such as Murphy's who marketed Tumbleweed to amateur gardeners as the "ultimate weedkiller of the 1980s" did not define themselves in relation to paraquat. Theses glyphosate products were liquid for "fast mixing and measuring" as well as "to avoid wastage", a decision that may have been related to the properties of glyphosate, but which perhaps also benefitted from the Pesticide Advisory Committee's experience of how granules did not necessarily preclude misuse or accidents. Neither did glyphosate marketing allude to backache, in fact one of the preparations was a gel to be painted on to individual weeds, a laborious if precise application method that certainly involved getting up close with the weed.[[290]](#footnote-291) Similarly to paraquat products, there was no antidote to glyphosate poisoning so it too could prove fatal when a critical quantity was ingested, although it appeared to be implicated in far fewer accidental poisonings than Gramoxone.[[291]](#footnote-292) Eventually, glyphosate replaced paraquat and diquat in Weedol, providing another example of retaining the strength of brand recognition that we saw earlier in Hayward and Tomlinson's Eureka weedkiller.

### Conclusions

Over the course of this chapter, we have seen that gardeners embraced new weedkillers whether they were relatively simple chemicals such as sodium chlorate, or more complex and sophisticated in the case of paraquat, because they reduced the physical work or effort of weeding and freed up time to do other things. The absence of oral history participants who used weedkillers meant that sources in published media and archives had to be heavily relied upon, and only an incomplete picture of the user experience was able to be sketched. A minority of gardeners rejected the specially domesticated formulation of paraquat, in favour of the industrial concentrate. While some of this illicit ownership and use of Gramoxone may have been opportunistic, such as when it was taken from work or if offered by an acquaintance, some domestic users sought it out from retailers. Sodium chlorate was available in a variety of forms, but gardeners could buy it and use it either dry or liquid, and at a strength of their choosing. Perhaps the behaviours associated with paraquat misuse, were not only related to reluctance or inability to buy the expensive domestic version but to the extremely narrowly prescribed way that Weedol was expected to be used, making it an oppressive, restrictive experience compared to other weedkillers, like sodium chlorate. In designing a separate, quite different domestic product to ensure that the chemical was used safely, the decisions made about formulation and presentation may have pushed some home gardeners into the unsafe behaviours that the manufacturers and Pesticides Advisory Committee wished to avoid.

One of the reasons that chemicals were misused in particular ways was through general knowledge, detailed and disseminated in the mainstream media, as well as other cultural and educative endeavours. Explosions and bangers made with sodium chlorate was considered something of a rite of passage in the journey to becoming a chemist. Leaving out these facts from school chemistry lessons in an attempt to remove the explosive recipe from general knowledge was futile because any interested person could read about it in textbooks. Nevertheless, even after sodium chlorate became notorious through its use by terrorists, gardeners do not appear to have been put off using the chemical. They were quite able to understand that the chemical was only dangerous under certain conditions, which were not present in their households.

When considering these chemicals misuse as poisons, it is particularly interesting that sodium chlorate, an allegedly harmless chemical, was used as a poison by humans but did not receive media attention and so this aspect appears to have been relatively unknown. In contrast, despite paraquat not being unusually toxic, and far better characterised that the older, established, sodium chlorate, it quickly gained a sinister reputation as a poison for humans. While all the deaths from paraquat were tragic, there was not really anything to distinguish them from other poisonings, other than the media attention they received.

The ready identification of a single company, ICI, as the source of the paraquat, rather than the numerous companies making sodium chlorate may provide the clue as to why paraquat generated such an uproar. ICI as a multinational corporation provided a convenient target for a limited, but highly voluminous, coverage of the chemical in mainstream media. As a new chemical, far greater detail was known about paraquat's effects and modes of action on plants and animals than for sodium chlorate, which had simply been on the market for longer. Plenty of other chemicals available in the home were decanted into unmarked containers, then accidentally ingested resulting in fatal poisoning, due to the lack of antidote or effective treatment. The fact that paraquat poisoning did not have an antidote, despite barely any other chemicals in everyday use having antidotes, was seized on in otherwise unremarkable, albeit tragic, cases of poisoning.

Indeed, representatives of chemical manufacturers and the committees that assessed product safety expected a minority of people to wilfully misuse any chemical as poison, and focused on directing the correct uses. Irresponsible behaviour, such as putting liquids into unlabelled, reused beverage bottles which led to accidental misuse happened with other household chemical products so had been predicted, but was extremely difficult to prevent through labelling alone, demonstrated by continued cases of mistaken identity following changes to cautionary words on the label.

Through the appropriate selection and application of herbicides, weeding was elevated to a more skilful task than just identification of target plants. Domestic users were encouraged by the model users they saw in print and broadcast media to engage with the most up to date methods, but were also reminded that old, relatively simple chemicals such as sodium chlorate remained perfectly good solutions to certain weed problems. Using herbicides domestically was not explicitly promoted by the manufacturers as modern, and while one of the adverts hinted at the emotional benefit of spending more time with your children when you spent less time on weeding, this tactic was not continued in other adverts. The pressures of modern life, the general sense of squeezed time were not articulated, nor the possibilities of what that extra time could be spent on. This sense of modernity was present in exhortations that the products would save time and ease effort, contributing to a more leisurely form of gardening. As much as I wanted to find evidence for chemical use equating to science and modernity in these adverts, the theme was not present. Instead, tradition and normalcy were promoted.

The price of herbicides raised questions about who was expected to use them, as herbicides are non-essential products which can be replaced by human labour. Their retail price, known by all who saw the packages or advertising, reflected the time and costs that went into the product's development and subsequent approval, as well as marketing, but also worked to limit the availability of the product to a group of users who are able and willing to spend. This made them an aspirational consumer good.

The diversity of non-professional situations means that amateur gardeners may not have seen the specially formulated domestic product as relevant for their needs, despite certainly not being a user trained to handle agrochemicals. The process of researching this chapter has suggested that the processes of developing branded products for domestic consumers has been overlooked, probably because of the many archival dead ends, at least at the company end. While the records kept by the Home Office relating to the PSPS and specifically the control of chemicals that turned out to be problematic, have proved to be a rich resource for this historian as they provided evidence of the discussions about the users.

The problem of domestic use of industrial strength products was not solved by more informative labelling, nor through controls on retailer. The separation of professional and domestic users continues to be porous, perhaps now more than ever with opportunities to easily buy potentially dangerous weedkillers online. The main positive point of this modern ease of access, is that the chemicals should be packaged appropriately, rather than in easily mistaken drinks bottles.

Manufacturers have learned from experience what happens when their chemicals get into domestic users hands', they fully understand that a minority of people wilfully disregard instructions for safe use, which has shaped their preferred formulations and delivery packaging in order to prevent harm when used as the manufacturers intended. This suggests that the focus should be turned to the users of such products, such that public information campaigns and education about why domestic formulations exist and how to safely store and handle chemicals at home may be useful. While it might not currently be fashionable to admit to having used, or using chemicals in the garden or around the home, people obviously are still motivated to buy strong, effective herbicides and if they choose to do so, accidental harm could be reduced through these educational measures.

1. Russell, Stan. "Laboratory Gardening." *Practical Gardening*, April 1964, 3.  
    [↑](#footnote-ref-2)
2. Russell, Stan. "Over the Fence." *Practical Gardening*, 1976. p5  
    [↑](#footnote-ref-3)
3. Fearnley-Whittingstall, Jane. *The Garden: An English Love Affair*. London: Weidenfeld & Nicolson, 2002. p287  
    [↑](#footnote-ref-4)
4. Sutton & Son, *Lawns*. London: Simpkin, Marshall, Hamilton, Kent & Co. Ltd, 1899. p25  
    [↑](#footnote-ref-5)
5. Constantine, S. (1981). Amateur Gardening and Popular Recreation in the 19th and 20th Centuries. *Journal of Social History,* 14(3), 387–406.  
    [↑](#footnote-ref-6)
6. JC Loudon "Suburban Gardener and Willa Companion" quoted in Holmes, Caroline. *New Shoots Old Tips*. London: Frances Lincoln, 2004. p25  
    [↑](#footnote-ref-7)
7. Holmes, Caroline. *New Shoots Old Tips*. London: Frances Lincoln, 2004. p21-22  
    [↑](#footnote-ref-8)
8. Beale, Reginald. *The Book of the Lawn: A Complete Guide to the Making and Maintenance of Lawns and Greens for All Purposes*. London: Cassell, 1931. p78  
    [↑](#footnote-ref-9)
9. "War on Weeds." *Practical Gardening*, June 1963, p65.  
    [↑](#footnote-ref-10)
10. Lawrence, Bill. "Shock Tactics: a Special Report on Weed Control." *Practical Gardening*, March 1981, 54-54.  
     [↑](#footnote-ref-11)
11. Bhatti, Mark, and Andrew Church. "‘I Never Promised You a Rose Garden’: Gender, Leisure and Home-Making." *Leisure Studies* 19, no. 3 (2000): 183-97.  
     [↑](#footnote-ref-12)
12. "The Care of Lawns." *The Times*  (10 September 1938): 13.  
     [↑](#footnote-ref-13)
13. Glasspoole, Claire. "25 Labour Saving Ideas." *Practical Gardening*, November 1966. p31  
     [↑](#footnote-ref-14)
14. "Gifts for Gardeners." *The Times*  (16 December 1933): 13.  
     [↑](#footnote-ref-15)
15. Roy, Hay. "Gifts for Gardeners." *The Times*  (07 December 1968): 24.  
     [↑](#footnote-ref-16)
16. Roy, Hay. "Say it with Fertiliser." *The Times*  (08 December 1973): 13.  
     [↑](#footnote-ref-17)
17. Lewis, A. "Soil Testing." *Practical Gardening*, June 1966, 20.  
     [↑](#footnote-ref-18)
18. Roy, Hay. "Green Fingered Gifts." *The Times*  (29 November 1975): 12.  
     [↑](#footnote-ref-19)
19. Church, Roy, and Christine Clark. "Purposive Strategy or Serendipity? Development and Diversification in Three Consumer Product Companies, 1918 - 1939: J & J Colman, Reckitt & Sons and Lever Bros./Unilever." Chap. 3 In *The Emergence of Modern Marketing*, edited by Roy Church and Andrew Godley. London: Frank Cass and Company Ltd, 2003.  
     [↑](#footnote-ref-20)
20. Cousins, Herbert. *The Chemistry of the Garden*. Macmillon Primers. 3rd ed.: Macmillon, 1943. p132  
     [↑](#footnote-ref-21)
21. Lanman, Susan W. "Colour in the Garden: 'Malignant Magenta'." *Garden History* 28, no. 2 (2000): 209-21.  
     [↑](#footnote-ref-22)
22. Agatha Christie novels containing weedkiller related deaths: The Cornish Mystery 1923, How does your garden grow 1935, Dumb Witness 1937  
     [↑](#footnote-ref-23)
23. Gillespie, Brendan. "British 'Safety Policy' and Pesticides." In *Directing Technology*, edited by Ron Johnston and Philip Gummett, 202-24. London: Croom Helm, 1979.  
     [↑](#footnote-ref-24)
24. Matthews, John. "Unions Press for Herbicide Ban." *New Scientist*, 21 February 1980, 558-.  
     [↑](#footnote-ref-25)
25. Robertson, John Home. "House of Commons Debate 'Herbicide 2,4,5-T'." *Hansard* 980 (1980): cc1544.  
     [↑](#footnote-ref-26)
26. Ashdown, Paddy. "House of Commons Debate "the Advisory Committee"." *Hansard* 81 (1985): cc960-3.  
     [↑](#footnote-ref-27)
27. Gillespie, Brendan. "British 'Safety Policy' and Pesticides." (1979) p209, 211.  
     [↑](#footnote-ref-28)
28. Russell, Stan. "Douse That Bonfire!". *Practical Gardening* 7, no. 2 (May 1966). Stan came back from an ABMAC conference with the statistic that agrochemical operatives had the lowest incidence of lung cancer, and that burning green material on bonfires released huge quantities of carcinogens, far worse than using garden chemicals.  
     [↑](#footnote-ref-29)
29. *Handyman Which?*, February 1973, p10  
     [↑](#footnote-ref-30)
30. *Chemicals for the gardener: for the control of plant pests, diseases and weeds*, MAFF, HMSO 1963  
     [↑](#footnote-ref-31)
31. Kennedy, p120  
     [↑](#footnote-ref-32)
32. “Pesticides and Posterity”, *Horizon*, BBC Television, first aired 30.05.64 (accessed BFI)  
     [↑](#footnote-ref-33)
33. HC Deb 20 July 1971 vol 821 cc1395-407  
     [↑](#footnote-ref-34)
34. Hassall, Kenneth A., and A. V. Percival. *Weed Control in the Home Garden: A Simple Guide*. West Byfleet: Percival, Best, Publications, 1973.  
     [↑](#footnote-ref-35)
35. [↑](#footnote-ref-36)
36. Ridler, P. "Clearer Labels." *Practical Gardening*, December 1966, 5.   
     [↑](#footnote-ref-37)
37. Rudd, E. "Dosage Chart." *Practical Gardening*, April 1964, 43.   
     [↑](#footnote-ref-38)
38. "Garden Notes." *The Times*  (09/07/1932/ 1932): 13.  
     [↑](#footnote-ref-39)
39. "Attractive Allotments and the National Scheme." *National Allotments Journal*, no. 21 (1934): 10-12.  
     [↑](#footnote-ref-40)
40. "A Wonderful Weed-Killer (Continued)." *National Allotments Journal*, no. 23 (1935): 19-21.  
     [↑](#footnote-ref-41)
41. "Attractive Allotments and the National Scheme." *National Allotments Journal*, no. 21 (1934): 10-12.  
     [↑](#footnote-ref-42)
42. Podger, Hugh. *Albright & Wilson: The Last 50 Years*. Sudley: Brewin Books Ltd, 2002. p15  
     [↑](#footnote-ref-43)
43. Podger (2002) p8  
     [↑](#footnote-ref-44)
44. Podger (2002) p15  
     [↑](#footnote-ref-45)
45. "Staveley's New Venture." *The Daily Mail*, 28 September 1935. p2  
     [↑](#footnote-ref-46)
46. "A Wonderful Weed-Killer (Continued)." *National Allotments Journal*, no. 23 (1935): 19-21.  
     [↑](#footnote-ref-47)
47. Display advertising, *The Daily Mail*, 27.04.40. p9  
     [↑](#footnote-ref-48)
48. Whitehead, Stanley B. *Garden Weeds and Their Control*. London: J.M. Dent, 1949. p58  
     [↑](#footnote-ref-49)
49. Display advertising, *The Daily Mail*, 17.04.54 p6  
     [↑](#footnote-ref-50)
50. "Weeding out the Weed-Killers." *The Daily Mail*, 18.09.1971, 19.  
     [↑](#footnote-ref-51)
51. Watson, James. "The Significance of Mr Richard Buckley's Exploding Trousers: Reflections on an Aspect of Technological Change in New Zealand Dairy Farming between the World Wars." *Agricultural History* 78, no. 3 (2004): 346-60.  
     [↑](#footnote-ref-52)
52. "A Wonderful Weed-Killer." *National Allotments Journal*, no. 22 (1934): p17  
     [↑](#footnote-ref-53)
53. "Garden Poisoner Injures Baby." *The Daily Mail*, 01 July 1958, 5.  
     [↑](#footnote-ref-54)
54. "A Wonderful Weed-Killer." *National Allotments Journal*, no. 22 (1934): p19  
     [↑](#footnote-ref-55)
55. Whitehead, Stanley B. *Garden Weeds and Their Control*. London: J.M. Dent, 1949. p59  
     [↑](#footnote-ref-56)
56. Overholser, Earle Long. "Study of the Shipment of Fresh Fruits and Vegetables to the Far East, Part 1." University of California, 1930. p33  
     [↑](#footnote-ref-57)
57. Reed, F. J. *Lawns and Playing Fields*. London: Faber and Faber, 1950.  
     [↑](#footnote-ref-58)
58. Sprague, Howard B. *Better Lawns for Homes and Parks*. Whittlesey House Garden Series. edited by F.F. Rockwell London: Whittlesey House, 1940. p169 and p172  
     [↑](#footnote-ref-59)
59. Whitehead, 1949 p59  
     [↑](#footnote-ref-60)
60. A Correspondent. "Weary Battle against the Weeds." *The Times*, 21 March 1959, 9.  
     [↑](#footnote-ref-61)
61. Glasspoole, Claire. "25 Labour Saving Ideas." *Practical Gardening*, November 1966. p31  
     [↑](#footnote-ref-62)
62. "Garden Poisoner Injures Baby." *The Daily Mail*, 01 July 1958, 5.  
     [↑](#footnote-ref-63)
63. "Police Rule out Cricket Tour Vigilantes." *The Times*, 07 May 1970, 2; "Wrecker Poisons Golf Links." *The Daily Mail*, 25 July 1960 1960, 7.  
     [↑](#footnote-ref-64)
64. [↑](#footnote-ref-65)
65. HO 144/23246 19 March 1941 letter to Dr Watts from Gonne St Clair Pilcher  
     [↑](#footnote-ref-66)
66. IMG\_3090 Letter from chief constable Reading police to the Explosives Department, Home Office  
     [↑](#footnote-ref-67)
67. "Extract from Minutes of Special Branch Conference (Regional) Held at Reading on 29/4/43.".MAFF: HO45/11240 National Archives, Kew, 1943.  
     [↑](#footnote-ref-68)
68. ""Atlacide"." *The Times*  (21 September 1944): 3.  
     [↑](#footnote-ref-69)
69. "Home made explosives (accidents)" HC Deb 28 June 1966 vol 730 cc250-1W  
     [↑](#footnote-ref-70)
70. "The Best Way to Keep Paths Free of Weeds." *The Daily Mail*, 13 June 1959.  
     [↑](#footnote-ref-71)
71. "Sodium chlorate" HC Deb 21 December 1961 vol 651 c178W  
     [↑](#footnote-ref-72)
72. Hansard "Sodium Chlorate "HC Deb 07 February 1963 vol 671 cc644-5  
     [↑](#footnote-ref-73)
73. "May in the Garden with ICI." *The Daily Mail*, 02 May 1970, p9.  
     [↑](#footnote-ref-74)
74. "Sodium Chlorate" HC Deb 07 February 1963 vol 671 cc644-5; "Sodium Chlorate" HC Deb 18 May 1966 vol 728 cc266-7W,   
     [↑](#footnote-ref-75)
75. Health and Executive Safety. 1998 "Storage and Use of Sodium Chlorate and Other Similar Strong Oxidants." p7.  
     [↑](#footnote-ref-76)
76. "Two Bob Bombs Menace Children." *The Daily Mail*, 20.08.64, 1.  
     [↑](#footnote-ref-77)
77. "Bomb-Making Outbreak." *The Times*  19.03.1962, 5  
     [↑](#footnote-ref-78)
78. R. E, Parker. "Warning Needed." *The Times*  (19/08/1964) 11  
     [↑](#footnote-ref-79)
79. Boots, Home and Garden. "Special Announcement: Sodium Chlorate." news release, 18 May 1970, 1970.  
     [↑](#footnote-ref-80)
80. British Agrochemicals Association. *Directory of Garden Chemicals*. Third ed. London: British Agrochemicals Association 1978.  
     [↑](#footnote-ref-81)
81. "Report of Her Majesty's Inspectors of Explosives for the Year Ended 31st December 1970." London: Home Office, 1971. p36  
     [↑](#footnote-ref-82)
82. "Two Bob Bombs Menace Children." *The Daily Mail*, 20.08.64 1964, 1.  
     [↑](#footnote-ref-83)
83. "Bath "Booby-Trap" Case." *The Times*, 12.12.1953, 3.  
     [↑](#footnote-ref-84)
84. "Son-in-Law 'Blew up Car with Sodium Bomb'." *The Daily Mail*, 03.10.1961 1961, 9.  
     [↑](#footnote-ref-85)
85. Geraghty, Tony. *The Irish War: The Hidden Conflict between the Ira and British Intelligence*. JHU Press, 1998. p189  
     [↑](#footnote-ref-86)
86. Rodwell, Robert. "Army Uncovers a Mrs Beeton for Bombers." *New Scientist*, 03.05.1973 1973, 276-77.  
     [↑](#footnote-ref-87)
87. "Revolutionaries and Anarchists Used Bombs against Political Enemies, Prosecution Says." *The Times*  11/11/1971  
     [↑](#footnote-ref-88)
88. "House of Commons Debate Northern Ireland (Control of Explosives) ". *Hansard* 838 (05 June 1972 1972): cc156-72.  
     [↑](#footnote-ref-89)
89. "House of Lords Debate "Explosives Security"." *Hansard* 365 (06 November 1975): cc1377-9.  
     [↑](#footnote-ref-90)
90. "House of Commons Debate 'Barking (Explosions)'." *Hansard* 977 (22 January 1980): cc206-11.  
     [↑](#footnote-ref-91)
91. "Disaster on the Doorstep." *The Daily Mail*, 27 September 1982, 14-15.  
     [↑](#footnote-ref-92)
92. "Exploding the Myth of Sodium Chlorate Safety." *New Scientist*, 22 March 1979, 935.  
     [↑](#footnote-ref-93)
93. "Weed-Killer Wife Jailed for Life." *The Daily Mail*, 21 July 1973, 11.  
     [↑](#footnote-ref-94)
94. "Spinster Killed Nosey Old Man - Police." *The Daily Mail*, 03 April 1962, 6.  
     [↑](#footnote-ref-95)
95. "Angry Husband 'Poisoned His Wife's Cereal'." *The Daily Mail*, 16 October 1985, 8.  
     [↑](#footnote-ref-96)
96. Knight, Author R. K., J. R. Trounce, and J. S. Cameron. "Suicidal Chlorate Poisoning Treated with Peritoneal Dialysis." *The British Medical Journal* 3, no. 5565 (1967): 601-02.  
     [↑](#footnote-ref-97)
97. "How I Wooed the Head by Lovelorn Caretaker." *The Daily Mail*, 15 May 1974, 15.  
     [↑](#footnote-ref-98)
98. Haworth, Carl, Alan, and Cleaning and environmental solutions (seller). "Questions & Answers: How Can You Sell Weedkiller Containing Sodium Chlorate When Wholesale of This Was Banned in 2009 & Use of It Since 2010?"   
     [↑](#footnote-ref-99)
99. Casey, P., and J.A. Vale. "Deaths from Pesticides Poisoning in England and Wales: 1945 - 1989." *Human & Experimental Toxicology* 13, no. 2 (1994): 95-101.  
     [↑](#footnote-ref-100)
100. MAF284/307, 2, PS427 SC 1175, Scientific Subcommittee on Poisonous Substances used in Agriculture and Food Storage, “First Report on Paraquat”, 23.03.62   
      [↑](#footnote-ref-101)
101. Howard, 1982, *Paraquat: Uses and Misuses*, MD thesis, University of Edinburgh, p2.  
      [↑](#footnote-ref-102)
102. “Improved Type of Weed Killer” The Times, 23.08.62, p10.; “Farewell to the plough” Daily Mail, 29.08.62  
      [↑](#footnote-ref-103)
103. Bradbury, McCarthy and Suckling, “Patterns of Innovation Part III – The bipyridyl herbicides, *Chemistry and Industry*, 4 March 1972, p195;   
      [↑](#footnote-ref-104)
104. Wain, p.139  
      [↑](#footnote-ref-105)
105. Kennedy, p146  
      [↑](#footnote-ref-106)
106. Stout, Ruth, and Richard V. Clemence. *The Ruth Stout No-Work Garden Book*. Emmaus, Pa.,: Rodale Press, 1971.  
      [↑](#footnote-ref-107)
107. SC 2376 Weedol Co-operator Trials  
      [↑](#footnote-ref-108)
108. [↑](#footnote-ref-109)
109. Gramoxone Data Sheet, SC 1174, 3 pages.  
      [↑](#footnote-ref-110)
110. "Extracts from Minutes: Advisory Committee on Poisonous Substances Used in Agriculture and Food Storage 20/03/62." National Archives, Kew, 1962.  
      [↑](#footnote-ref-111)
111. Gramoxone W label HO 305/32, National Archives, Kew.  
      [↑](#footnote-ref-112)
112. Pl/w, SW 1169, Paraquat SC1174 draft SC1175 Advisory Committee on Poisonous Substances Used in Agriculture and Food Storage 2 pages. 20.03.62 (IMG\_3002 and 3003 in my files)  
      [↑](#footnote-ref-113)
113. Howard, (1982)  
      [↑](#footnote-ref-114)
114. MAF 284/307 "Extracts from Minutes: Advisory Committee on Poisonous Substances Used in Agriculture and Food Storage stamped 20/03/62." National Archives, Kew, 1962.  
      [↑](#footnote-ref-115)
115. MAF 284/289 "[Extracts] Minutes of 89 Meeting 28 April '64 (SC1850): Scientific SubCommittee Advisory Committee on Poisonous Substances Used in Agriculture and Food Storage" National Archives, Kew, 1964.  
      [↑](#footnote-ref-116)
116. MAF 284/307 "SC1174: Gramoxone Data Sheet." MAF 284/307 National Archives, Kew, 1962.  
      [↑](#footnote-ref-117)
117. SC 2376 Weedol Co-operator Trials  
      [↑](#footnote-ref-118)
118. SC 2376 Weedol Co-operator Trials Summary of Information obtained from questionnaires p3  
      [↑](#footnote-ref-119)
119. "Coroners and the Public Interest." *The British Medical Journal* 3, no. 5927 (1974): 374

     [↑](#footnote-ref-120)
120. "Ends the work of weeding" Daily Express, 03.04.65 p14; "My Dad's a Weedol weeder" Daily Mirror, 06.05.67, p21  
      [↑](#footnote-ref-121)
121. Howard, p13.  
      [↑](#footnote-ref-122)
122. “Information On Poisons” *The British Medical Journal* , Vol. 1, No. 5339 (May 4, 1963), p. 1220  
      [↑](#footnote-ref-123)
123. “Weedkiller Warning”, Peter Bullen, Daily Mail, 25.05.68, p4   
      [↑](#footnote-ref-124)
124. Swan, A. A. B. "Letter to F. Stewart 13 May 1968." National Archives, Kew.  
      [↑](#footnote-ref-125)
125. Holloway, G. R. "Letter to F. Stewart: Paraquat 12 March 1968." National Archives, Kew.  
      [↑](#footnote-ref-126)
126. Plant Protection Limited. "Sc1174: Gramoxone Data Sheet." MAF 284/307 National Archives, Kew, 1962.  
      [↑](#footnote-ref-127)
127. MAF 284/307, 149, p4 Letter from AAB Swan (Plant Protection Ltd) to F Stuart (Poisons Board) 16.02.68, National Archives, Kew  
      [↑](#footnote-ref-128)
128. MAF 284/307, 149, p3 Letter from AAB Swan (Plant Protection Ltd) to F Stuart (Poisons Board) 16.02.68, National Archives, Kew   
      [↑](#footnote-ref-129)
129. MAF 284/307, 199-201 Letter from CE Rabington (MAFF Regional Safety Inspector) to J Rowe (MAFF Deputy Chief Inspector) giving details of article in *Cambridge Daily News*, 09.11.68 “Label on bottle of weed killer said 'Lemonade'”  
      [↑](#footnote-ref-130)
130. MAF 305/32 Holloway, G. R. "Letter to Bates, 25th October 1968." National Archives, Kew..  
      [↑](#footnote-ref-131)
131. MAF 305/32 Letter from Stewart, P. to Holloway 30 April 1969 "Paraquat" National Archives, Kew  
      [↑](#footnote-ref-132)
132. MAF 305/32 Letter from Stewart, F. to Holloway G.R. 30 April 1969, Letter from Holloway, G. R. to Stewart, F. 06 June 1969", "Extract from Minutes of the 86th Meeting of Adivisory Committee on Pesticides and Other Toxic Chemicals Held 15/01/70." National Archives, Kew, 1970.  
      [↑](#footnote-ref-133)
133. Buton, John. "Report by the Coroner on the Inquest Upon Robert Staples." In *Control of Paraquat*: National Archives, Kew, 1971.  
      [↑](#footnote-ref-134)
134. Staples, Gordon. "Letter from Mr Staples to Mr Onslow." 6. In *Control of Paraquat*: National Archives, Kew, 1971.  
      [↑](#footnote-ref-135)
135. Buton, John. "Report by the Coroner on the Inquest Upon Robert Staples." In *Control of Paraquat*: National Archives, Kew, 1971.  
      [↑](#footnote-ref-136)
136. “Girl drinks first and dies” Daily Mail, 30.09.72 p9  
      [↑](#footnote-ref-137)
137. "New Coroners Rules." *The British Medical Journal* 1, no. 4809 (1953): 554-55.  
      [↑](#footnote-ref-138)
138. Pilling, H. H. "Coroners' Jurisdiction." *The British Medical Journal* 3, no. 5558 (1967): 179.  
      [↑](#footnote-ref-139)
139. Carlisle, Mark. "Letter to Cranley Onslow, MP, from Mark Carlisle." National Archives, Kew, 1971; Stewart, F. "Letter to DH Morpeth from F Stewart: Paraquat 01 December 1971." National Archives, Kew, 1971.  
      [↑](#footnote-ref-140)
140. B&Q advert, Daily Mail, 25.05.88, p11  
      [↑](#footnote-ref-141)
141. Boots advert, 25% off all garden chemicals, Daily Mail, 19.05.79, p30  
      [↑](#footnote-ref-142)
142. “Super Summer” Timothy Whites advert, Daily Express, 17.05.68  
      [↑](#footnote-ref-143)
143. Woolworths advert, Daily Mail, 27.05.87, p17  
      [↑](#footnote-ref-144)
144. "Don't waste time with weeds"   
      [↑](#footnote-ref-145)
145. MAF 284/307, 61, Letter from Labrum to Wiseman (PPL) 02 August 1965, National Archives, Kew.  
      [↑](#footnote-ref-146)
146. "Killer chemical goes on Poisons List", Daily Mail, 09.09.68 p6  
      [↑](#footnote-ref-147)
147. 'Poison death: Firm rapped', Daily Mirror, 31.10.72, p9  
      [↑](#footnote-ref-148)
148. “Killer chemical goes on Poisons List” Daily Mail 09.09.68, p6  
      [↑](#footnote-ref-149)
149. “Should this killer be allowed?” DM, 30.08.72, p6  
      [↑](#footnote-ref-150)
150. Easton, P. H. "Regulations on the Sale of Paraquat."HO305/32: National Archives, Kew, 1973.  
      [↑](#footnote-ref-151)
151. "Now paraquat must carry poison label", Daily Mail, 02.02.74, p11  
      [↑](#footnote-ref-152)
152. Memo from DA Wrigley, 18.10.72  
      [↑](#footnote-ref-153)
153. "Paraquat's toll of 97 victims" Daily Express, 13.07.74 (mentions murderer Jennifer Kenyon using a false name)  
      [↑](#footnote-ref-154)
154. “Should this killer be allowed?” DM, 30.08.72, p6  
      [↑](#footnote-ref-155)
155. HO 305/32, Letter from R Kendall to GR Waters, 22.01.74  
      [↑](#footnote-ref-156)
156. “Strict controls imposed on paraquat weedkiller” The Times, 02.02.74, p2; “Now paraquat must carry poison label” Daily Mail, 02.02.74 p11.   
      [↑](#footnote-ref-157)
157. “Worth the extra pound or two” The Times, 07.09.68, p22.  
      [↑](#footnote-ref-158)
158. Weedol: Public Warning, HL Deb 02.06.80, vol 409 cc1104-6;  
      [↑](#footnote-ref-159)
159. **'Gramoxone'w**. ***The Times*** (London, England), Monday, Dec 07, 1964; pg. ii; Issue 56188.   
      [↑](#footnote-ref-160)
160. Herbert, DWM. "Paraquat." In *HO305/32*, MAFF: National Archives, Kew, 1973.  
      [↑](#footnote-ref-161)
161. "First in the Field" **Plant Protection**.  
     ***The Times*** (London, England), Monday, Dec 02, 1963; pg. v; Issue 55873. [↑](#footnote-ref-162)
162. MAF 284/307 Bureau of Commercial Research Ltd (Research Division of Erwin Wasey, Ruthrauff and Ryan Ltd). "Report of a Placement Test for Weedol Weedkiller October 1964." National Archives, Kew, 1964. [↑](#footnote-ref-163)
163. “Don't waste time with weeds”, Spring 1967 Campaign. *The Times* 10 June 1967, p8. [↑](#footnote-ref-164)
164. “Amazing new weeder discovery ENDS THE WORK OF WEEDING” Spring 1965, *Daily Express*, 03 April 1965, p14;“End the work of weeding with Weedol” Weedol advertisement, Spring 1966 Campaign, *Daily Mail*, 16 April 1966. [↑](#footnote-ref-165)
165. "Weedol kills weeds without killing the soil (or your back)" *The Daily Mai*l 24 March 1970, p3 [↑](#footnote-ref-166)
166. "Stand up to weeds!" *Daily Mirror*, 13 April 1968, p20 [↑](#footnote-ref-167)
167. "Tudor 'Weedol' Applicator Made to Make 'Weedol' Weeding Easier Still." *The Daily Mail*, 18 May 1968, 6. [↑](#footnote-ref-168)
168. Turner, W. "Safer Weed-Killer Spraying." *Practical Gardening*, October 1966, p65. [↑](#footnote-ref-169)
169. Russell, Stan. "Over the Fence." *Practical Gardening*, July 1975, 5. [↑](#footnote-ref-170)
170. du Boton, Roger. "Doomwatch Checks Chemical Safety." *Practical Gardening*, 1971, 69; Lawrence, Bill. "Shock Tactics a Special Report on Weed Control." *Practical Gardening*, March 1981, 54-54. [↑](#footnote-ref-171)
171. Prosser, Alf. "Growing Prices." *Practical Gardening*, 1980, p7. [↑](#footnote-ref-172)
172. “Amazing new weeder discovery ENDS THE WORK OF WEEDING” Spring 1965, Daily Express, 03.04.65, p14 as first instance. Alternated each week between Express and the Mirror until mid May. Did not appear in the Mail or the Times. [↑](#footnote-ref-173)
173. MAF 284/307 Bureau of Commercial Research Ltd (Research Division of Erwin Wasey, Ruthrauff and Ryan Ltd). "Report of a Placement Test for Weedol Weedkiller October 1964." National Archives, Kew, 1964. [↑](#footnote-ref-174)
174. “End the work of weeding with Weedol” Weedol advertisement, Spring 1966 Campaign, Daily Mail, 16.04.66. This advert appeared in the Mirror and Express, but not the Times. [↑](#footnote-ref-175)
175. MAF 284/307 Bureau of Commercial Research Ltd (Research Division of Erwin Wasey, Ruthrauff and Ryan Ltd). "Report of a Placement Test for Weedol Weedkiller October 1964." National Archives, Kew, 1964. [↑](#footnote-ref-176)
176. “My dad's a Weedol weeder!” Weedol advertisement, Spring 1967 Campaign, Daily Mirror 24.04.67, p21 was the first instance of this advert. There were two image variants, using the same text, which were run each weekend for a month (until 25.05.67). [↑](#footnote-ref-177)
177. “Don't waste time with weeds”, Spring 1967 Campaign. The Times 10.06.67, p8. On this date the same advert also appeared in the Express and Mirror [↑](#footnote-ref-178)
178. “Super Summer” Timothy Whites advert, Daily Express, 17.05.68 [↑](#footnote-ref-179)
179. Marchand, Roland. "Advertisements as Social Tableaux." In *Advertising and the American Dream: Making Way for Modernity, 1920 - 1940*, 164-205. Berkley: University of California Press, 1985. [↑](#footnote-ref-180)
180. Zayer, Linda Tuncay. "A Typology of Men's Conceptualizations of Ideal Masculinity in Advertising." *Advertising & Society Review* 11, no. 1 (2010). [↑](#footnote-ref-181)
181. Hilton, Matthew. *Smoking in British Popular Culture, 1800-2000 : Perfect Pleasures*. Studies in Popular Culture. Manchester, UK ; p119 [↑](#footnote-ref-182)
182. Marchand, Roland. "Advertisements as Social Tableaux." In *Advertising and the American Dream: Making Way for Modernity, 1920 - 1940*, 164-205. Berkley: University of California Press, 1985. [↑](#footnote-ref-183)
183. "Waging War on Weeds." *Good Housekeeping*, July 1975, p110. [↑](#footnote-ref-184)
184. "Your garden pin-up" Amateur Gardening Annual, 1970, p78. This immediately preceded an article "Chemicals: where do we stand?" [↑](#footnote-ref-185)
185. "Stop weeds going to bed with your flowers", Spring 1978 campaign, Daily Mail, 08.04.78, p32 [↑](#footnote-ref-186)
186. “To get plenty of vegetables, I give them plenty of help” ICI Garden Products Even the greenest fingers need a little help, Daily Express, 04.09.77, p22. This advert featured soil conditioner (mulch), granulated fertiliser, and Weedol. ; "Fast and easy. That's how I get rid of weeds" Daily Mail, 16.04.77 p31. Advert for Weedol and Pathclear. In both adverts, Percy is shown holding his pipe [↑](#footnote-ref-187)
187. Timothy O'Sullivan, ‘Thrower, Percy John (1913–1988)’, rev. *Oxford Dictionary of National Biography*, Oxford [↑](#footnote-ref-188)
188. "The Home That 2 Built: The Sixties." BBC Two, 14 November 2014. [↑](#footnote-ref-189)
189. "Gardening" The Times, 16.05.70, p26; "Gardening" The Times, 04.07.70 p23 [↑](#footnote-ref-190)
190. Take the backbreak out of weeding' Roy Hay, The Times, 17.06.67, p6 [↑](#footnote-ref-191)
191. 'Take the backbreak out of weeding' Roy Hay, The Times, 17.06.67, p6 (this article predominantly about ground cover was adjacent to a Weedol advert); 'A case for ground cover.' Times [London, England] 1 June 1974: 13, Roy Hay. 'Covering a lot of ground.' Times [London, England] 15 June 1974: 12. [↑](#footnote-ref-192)
192. "Gardening" The Times, 10.05.67, p5 [↑](#footnote-ref-193)
193. Thomas, Kevin D. "Understanding Representations of Black and White Manhood in Print Advertising." *Advertising & Society Review* 14, no. 2 (2013). [↑](#footnote-ref-194)
194. Smith, Ian. "Husband Aids Police in Poison Case." *The Daily Mail*, 31 October 1973, 13 [↑](#footnote-ref-195)
195. Howard, p92, 113 [↑](#footnote-ref-196)
196. Howard, 216 [↑](#footnote-ref-197)
197. SC3078 Paraquat and diquat liquid formulations summary of experience of human exposure December 1965 – May 1967, National Archives; “Girl drinks first and dies” Daily Mail, 30.09.72 [↑](#footnote-ref-198)
198. “Children steal deadly weedkiller” Daily Mail, 30.08.72, p3 [↑](#footnote-ref-199)
199. “The killer inside the bottle” Daily Mail, 08.07.72, p20; “Doctors save paraquat toddler” Daily Mail, 18.11.72, p3; “Alive! The boy who drank paraquat” Daily Mail, 06.08.82, p1 [↑](#footnote-ref-200)
200. “Bottle said lemonade but it killed Beverley” Daily Mail 14.08.68 (clipping from paper, no page, 'Poison tragedy of a gardener' Daily Express, 30.09.72, p15 [↑](#footnote-ref-201)
201. 'Poison tragedy of a gardener' Daily Express, 30.09.72, p15 [↑](#footnote-ref-202)
202. Swan, A. A. B. "Letter to F. Stewart, Poisons Board." National Archives, Kew, 1968. [↑](#footnote-ref-203)
203. “Boy and Girl in lung-swop operation” Daily Mail, 13.05.68, p1 [↑](#footnote-ref-204)
204. SC3078 Paraquat and diquat liquid formulations summary of experience of human exposure December 1965 – May 1967; “Man drank weedkiller by mistake” The Times, 11.12.69, p 5; [↑](#footnote-ref-205)
205. SC3078, Paraquat and Diquat liquid formulations summary of experience of human exposure December 1965 - May 1967 [↑](#footnote-ref-206)
206. “Poison husband's grief”, Daily Mail, 23.11.77, p11 [↑](#footnote-ref-207)
207. 'Weedkiller was nice, dying child whispered' The Times, 19.07.72, p2 [↑](#footnote-ref-208)
208. Smith, L.L. "Mechanisms of Paraquat Toxicity in Lung and Its Relevance to Treatment." *Human & Experimental Toxicology* 6, no. 1 (1987): 31-36. [↑](#footnote-ref-209)
209. Howard, p162 [↑](#footnote-ref-210)
210. “Paraquat poisoning Treated by forced diuresis” F. Kerr *et al* (1968), *BMJ,* vol 3, No. 5613, pp. 290-291 [↑](#footnote-ref-211)
211. Howard, p30 (oxygen), p169 (forced diruresis) [↑](#footnote-ref-212)
212. Vale et al, 1987 [↑](#footnote-ref-213)
213. Kennedy, p.148 [↑](#footnote-ref-214)
214. HO305/32, Extract from minutes of 66th Meeting of the Poisons Board, 23.2.73 [↑](#footnote-ref-215)
215. “Child died from weed killer” The Times, 14.08.68, p2 [↑](#footnote-ref-216)
216. P. Meara, Personal communication, email 28.01.14 [↑](#footnote-ref-217)
217. SW 1169, 182, PNM Moore documenting a telephone conversation with Holloway 26.6.68, National Archives, Kew [↑](#footnote-ref-218)
218. MAF 284/307 Bureau of Commercial Research Ltd (Research Division of Erwin Wasey, Ruthrauff and Ryan Ltd). "Report of a Placement Test for Weedol Weedkiller October 1964." National Archives, Kew, 1964. [↑](#footnote-ref-219)
219. Prosser, Alf. "Growing Prices." *Practical Gardening*, 1980, p7. [↑](#footnote-ref-220)
220. Scientific Subcommittee on Poisonous Substances used in Agriculture and Food Storage. "Extract from Meeting 9th September 1969." National Archives, Kew, 1969. [↑](#footnote-ref-221)
221. Hawkes, Nigel, and Jane Edgington. "Ban This Poison." *The Observer*, 25 March 1973, 44-45. [↑](#footnote-ref-222)
222. “The boy who thought he'd had a drink of pop”, Jane Gaskell, The Daily Mail, 24.06.71, p6. [↑](#footnote-ref-223)
223. “The killer inside the bottle” Daily Mail, 08.07.72, p20; [↑](#footnote-ref-224)
224. "Poison Husband's Grief." *The Daily Mail*, 23 November 1977, 11. [↑](#footnote-ref-225)
225. “Weedkiller Warning”, Peter Bullen, Daily Mail, 25.05.68, p4 [↑](#footnote-ref-226)
226. “Lung Transplant in Edinburgh”, Glasgow Herald, 17.05.68, p1 [↑](#footnote-ref-227)
227. “Boy and Girl in lung-swop operation” Daily Mail, 13.05.68 , p1; “Lung boy sits up for icecream”, Daily Mail, 18.05.68, p1; “Lung transplant boy dies” Daily Mail, 29.05.68, p1 [↑](#footnote-ref-228)
228. “Boy with new lung winks at father” The Times, 18.05.68, p10 [↑](#footnote-ref-229)
229. Matthew et al, BMJ Vol 3, no 5621, pp 759-763 759 [↑](#footnote-ref-230)
230. Scientific Subcommittee on Poisonous Substances Used in Agriculture and Food Storage [↑](#footnote-ref-231)
231. 'Poison death: Firm rapped', Daily Mirror, 31.10.72, p9 [↑](#footnote-ref-232)
232. “Should this killer be allowed?” Daily Mail, 30.08.72, p6; [↑](#footnote-ref-233)
233. “Man drank weedkiller by mistake”, The Times, 11.12.69, p.5 [↑](#footnote-ref-234)
234. “Peril of poison in a pop bottle”, Daily Mirror, 16.11.72, p22 [↑](#footnote-ref-235)
235. “Girl drinks first and dies”, Daily Mail, 30.09.72, p9 [↑](#footnote-ref-236)
236. Handyman Which?, Feburary 1973, p57 [↑](#footnote-ref-237)
237. Fifth report on paraquat - Home Garden Use, MAF 284 307, doc 108 {IMG\_2917} [↑](#footnote-ref-238)
238. "Medical Record of Weedol Use." In *Poisonous Substances Paraquat*, 5: National Archives, Kew. [↑](#footnote-ref-239)
239. “Read the label”, Letter from TRL Waring ICI Plant Protection, Daily Express, 06.08.74, p3 [↑](#footnote-ref-240)
240. “Read the label”, Letter from TRL Waring ICI Plant Protection, Daily Express, 06.08.74, p3; 'Why they died' Letter from AI Allen Press Officer ICI, Daily Express, 02.12.72, p16 [↑](#footnote-ref-241)
241. Scientific Subcommittee on Poisonous Substances used in Agriculture and Food Storage, "Fifth Report on Paraquat - Home Garden Use." National Archives, Kew [↑](#footnote-ref-242)
242. Howard 1982 p184 [↑](#footnote-ref-243)
243. Millard (2012) [↑](#footnote-ref-244)
244. “Paraquat: Firm urged to act”, Daily Mail, 31.10.72, p11 [↑](#footnote-ref-245)
245. “Should this killer be allowed?” DM, 30.08.72, p6; [↑](#footnote-ref-246)
246. Howard (1982), p177 -183 [↑](#footnote-ref-247)
247. Extract from minutes of 66th Meeting of the Poisons Board, held on 23.2.73, Paraquat PB 998 IMG\_2643 - check Kew sequence to find file name [↑](#footnote-ref-248)
248. Weedkiller was nice, dying child whispered' The Times, 19.07.72, p2 [↑](#footnote-ref-249)
249. Arsenic, King of Poisons? [↑](#footnote-ref-250)
250. Colling, Keith. "The Couple Who Nearly Got Away with Murder." *The Daily Mail*, 03 July 1974, 23. [↑](#footnote-ref-251)
251. Smith, Ian. "Husband Aids Police in Poison Case." *The Daily Mail*, 31 October 1973, 13 [↑](#footnote-ref-252)
252. "Wife Accused of Poison Killing." *The Daily Mail*, 12 December 1973, 11. [↑](#footnote-ref-253)
253. Watson, Katherine. *Poisoned Lives : English Poisoners and Their Victims*. London ; New York: Hambledon and London, 2004. [↑](#footnote-ref-254)
254. "Stop weeds going to bed with your flowers", Spring 1978 campaign, Daily Mail, 08.04.78, p32 [↑](#footnote-ref-255)
255. ''I'll pole-axe you' a mother's shout at murder case', Daily Mail, 05.07.74, p13; “Poison stew wife is jailed for life” Daily Mail, 10.01.75, p3 [↑](#footnote-ref-256)
256. Andrews, B. "To Sir, with Hate." *The Daily Mail*, 10 November 1978, 38. [↑](#footnote-ref-257)
257. "Crossword No. 4714." *The Daily Mail*, 14 September 1978, 36. [↑](#footnote-ref-258)
258. Knight, Jill. "Health Services Bill, House of Commons Debate Order for Second Reading ". Chap. cc200-337 In *Hansard*, cc288, 1976; Golden, James. "Life for the Killer of Born-Again Christian." *The Daily Mail*, 28 March 1987, 15. [↑](#footnote-ref-259)
259. “Jail for Coke blackmailer”, The Times, 23.11.74 p3 [↑](#footnote-ref-260)
260. “Anger over 'poisoned turkeys'” Daily Mail, 20.12.82, p10 [↑](#footnote-ref-261)
261. “Another turkey alarm”, Daily Mail, 21.12.82 p22 [↑](#footnote-ref-262)
262. “More poisoned food may be lying in shops” The Times, 08.05.81 (front page leader, article p7); “Safeway food poison dose 'not lethal'”, The Times, 09.05.81, p2. [↑](#footnote-ref-263)
263. “Poisoner hits supermarket shelves”, Daily Mail, 22.06.87, p2 [↑](#footnote-ref-264)
264. “Poison food threat”, Daily Mail, 15.08.87, p2 [↑](#footnote-ref-265)
265. “Safeway counts cost of scare” Daily Mail, 09.05.81, p2. [↑](#footnote-ref-266)
266. “Paraquat drums lost from lorry”, The Times, 28.03.74, p2 [↑](#footnote-ref-267)
267. “Children steal deadly weedkiller” DM, 30.08.72, p3 [↑](#footnote-ref-268)
268. “Poison overboard!” DM, 06 April 1973, p17; "Coast Alert on Lost Weedkiller." *The Guardian*, 06 April 1973, 1. [↑](#footnote-ref-269)
269. “Deadly shower” DM, 25.08.80, p11 [↑](#footnote-ref-270)
270. “Children eat poison spray blackberries” DM, 25.08.73 p13 [↑](#footnote-ref-271)
271. Howard, p65. [↑](#footnote-ref-272)
272. Kendall, R. "Letter to J Harrison from R Kendall." 27 March 1973 HO305/32, National Archives, Kew. [↑](#footnote-ref-273)
273. Oliver, G. C. S. "Letter to Horticultural and Advisory Dept. MAFF 17 February." In *Poisonous Substances Paraquat*: National Archives, Kew, 1967. [↑](#footnote-ref-274)
274. Holloway, G. R. "Letter to Mr Oliver 14th March, 1967." National Archives, Kew, 1967. [↑](#footnote-ref-275)
275. “Research the Springboard of Progress” The Times, 18.12.63, p.9 [↑](#footnote-ref-276)
276. HO305/32, Letter from Mr Mathewson, 30.01.73 [↑](#footnote-ref-277)
277. HO305/32, Letter from JL Gilloran, 02.03.73 [↑](#footnote-ref-278)
278. HO305/32, Letters from R. Kendall to Mathewson, 14.02.73, and 13.03.73 [↑](#footnote-ref-279)
279. Handyman Which? February 1973, p9 [↑](#footnote-ref-280)
280. Hawkes, Nigel, and Jane Edgington. "Ban This Poison." *The Observer*, 25 March 1973, 44-45. [↑](#footnote-ref-281)
281. Howard p147 [↑](#footnote-ref-282)
282. Morpeth, D. H. "Paraquat." HO305/32: National Archives, Kew, 11 October 1972; Kendall, R. "Poisons Board: Paraquat." HO305/32: National Archives, 07 February 1973. [↑](#footnote-ref-283)
283. “Should this killer be allowed?” DM, 30.08.72, p6; “Paraquat: Treatment for a lethal dose” The Times, 11.12.74, p18 [↑](#footnote-ref-284)
284. HO305/32, Extract from minutes of 66th Meeting of the Poisons Board, 23.2.73 [↑](#footnote-ref-285)
285. Meredith, T.J., and J.A. Vale. "Treatment of Paraquat Poisoning in Man: Methods to Prevent Absorption." *Human & Experimental Toxicology* 6, no. 1 (1987): 49-55. [↑](#footnote-ref-286)
286. Tesco took out full page advertisements to announce that their household products contained the additive. Tesco. "We're Hoping Our Latest Innovation Will Be Hard to Swallow." *The Daily Mail*, 1988, 21. [↑](#footnote-ref-287)
287. Farm and Garden Chemicals, HC Deb 20.07.71, vol 821 cc1395-407 [↑](#footnote-ref-288)
288. Price, TH. "Colouring of Liquid Arsenical Weedkillers." National Archives, Kew, 1922. [↑](#footnote-ref-289)
289. Deeweed advert, Daily Mail, 04.07.81, p27 [↑](#footnote-ref-290)
290. Murphy's. "New Tumbleweed Does More Than Any Other Weedkiller." *Practical Gardening*, 1980. [↑](#footnote-ref-291)
291. Beswick, E., and J. Millo. "Fatal Poisoning with Glyphosate Surfactant Herbicide." *The Intensive Care Society* 12, no. 1 (2011): 37-39. [↑](#footnote-ref-292)