

THE USE OF HERBICIDES IN HORTICULTURAL
APPLICATIONS IN SEDGWICK COUNTY, KANSAS

by

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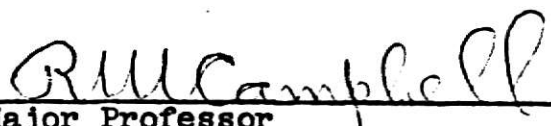
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Section 1

INTRODUCTION

The use of herbicides in horticulture has become an increasingly important practice during the past twenty five years. A survey was conducted in Sedgwick County, Kansas to develop an understanding of the extent and types of herbicides being used in horticultural applications. Personal contacts were made with persons involved in the recommendation, sale, and use of herbicides in the county. Table 1 shows the persons contacted and their area of interest.

The method used in conducting the survey was to introduce my interest to the person being interviewed and encourage them to describe their involvement and experience in the use of herbicides. Information sought from the interview included sources of information and recommendations, the types of herbicides being used or being sold, crops to which they are being applied, sources of herbicides, and their effectiveness.

Results of the survey are presented in Section 3 — Use of Herbicides by Homeowners, and Section 4 — Use of Herbicides by Commercial Growers.

In the report, Extension includes the Sedgwick County Agricultural Extension Service, Kansas State University Extension Specialists, horticulturists engaged in research contributing to Experiment Station or Extension publications, and staff at the

Sedgwick County Experiment Field. Kansas Agricultural Experiment Station Bulletin 564, Chemical Weed Control in Horticultural and Forestry Plants, 1973, (8) provided the basic format for the survey and the report.

Information on residential-homeowner use of herbicides was obtained from suppliers and Extension personnel.

Wholesale suppliers refer to those in the distribution system selling to retail sales outlets rather than to the ultimate user of the herbicide. Retail suppliers and suppliers are used in the report to refer to those in the distribution system selling products directly to the user.

Table 1
Contacts Made During the Survey

Extension

N. Warminski	Sedgwick County Agricultural Extension Service
F.D. Morrison	Associate Horticulturist, Fruit & Nut Crops, KSU
L.D. Leuthold	Extension Horticulturist, Ornamental Hort., KSU
C. Marr	Extension Horticulturist, Vegetable Crops KSU
C.E. Long	Assistant Horticulturist, Herbicides, KSU
J.K. Greig	Horticulturist, Vegetable Crops, KSU
J.C. Pair	Ornamental Research, Sedgwick County Experimental Field
F.J. Dainello	Food Crops Research, Sedgwick County Experimental Field

Wholesale Suppliers

R. McCausland	George Wise Co., Wichita, Kansas
R.E. Geary	Bartles & Shores Co., Wichita, Kansas
R. Shores	Bartles & Shores Co., Kansas City, Missouri
K. Lindscott	Thompson Hayward Chemical Co., Wichita, Ks.
W.F. Kessler	Cypress Agro Industries, Haysville, Kansas

Retail Suppliers

Johnson's Garden Center, Wichita, Kansas
 Plant Kingdom Garden Center, Wichita, Kansas
 Borst Nursery and Garden Center, Wichita, Kansas
 Greiner and Sons Nursery, Mulvane, Kansas
 Hillside Nursery, Wichita, Kansas
 Abe Meyer Nursery, Wichita, Kansas
 Wichita Co-op Association, Wichita, Kansas
 M. Meyer & Son, Wichita, Kansas
 Dutchman's Nursery, Wichita, Kansas
 K-Mart West, Wichita, Kansas

Nursery Stock Producers

Borst Nursery and Garden Center, Wichita, Kansas
 Hillside Nursery, Wichita, Kansas
 Abe Meyer Nursery, Wichita, Kansas
 M. Meyer & Son Nursery, Wichita, Kansas
 Dutchman's Nursery, Wichita, Kansas
 Greiner & Son Nursery, Mulvane, Kansas

Turf Producers

Hillside Nursery, Wichita, Kansas
 M. Meyer & Son Nursery, Wichita, Kansas
 Abe Meyer Nursery, Wichita, Kansas

(Continued)

Table 1 (Continued)

Fruit Crop Producers

Cain Orchards, Wichita, Kansas
Shaw Orchard, Wichita, Kansas
Johnson's Orchards, Wichita, Kansas
Mahoney & Youngmeyer Orchards, Wichita, Kansas
M. Meyer & Son Nursery, Wichita, Kansas

Vegetable Crop Producers

Roy Sargeant, Wichita, Kansas
Charles Sargeant, Wichita, Kansas
Jerry Brunhorst, Wichita, Kansas
Johnson's Orchards, Wichita, Kansas
Ernest Moon, Haysville, Kansas
Jack Heabner, Derby, Kansas

Section 2

HISTORY AND CLASSIFICATION OF HERBICIDES

Prior to World War II, weed control was primarily a matter of cultivation, burning, and mowing. Some control was achieved by ecological principles related to crop timing, crop rotation, crop competition, and water management. Soil sterilant chemicals were available as industrial by-products and petroleum oils were used for their phytotoxic effect, but modernized versions of ancient cultivating tools were the mainstay of weed control. Cultivation is still an important practice in modern weed control, but the discovery of 2, 4-D and its application to agriculture has brought about great changes. It was found that 2, 4-D would kill many broadleaf weeds in a field of wheat or corn without harming the crop itself. It became possible to remove many important weeds from this type of crop with a very small expenditure. Since the original 2, 4-D, many highly effective relatives have been formulated, tested, and introduced to agriculture.

New sub sciences in plant physiology, agronomy, and ecology have developed from the impact of widespread use of herbicides.

Herbicides may be classified as soil sterilants, contact herbicides, or translocated herbicides. Soil sterilants include the chlorates, such as sodium chlorate, the borates, such as

sodium tetraborate and borax, and arsenicals, such as arsenic trioxide and sodium arsenite. Their importance to horticulture is limited to non-crop areas around borders, fencelines, buildings, and parking areas.

Contact herbicides are those which kill plant tissues which they contact. They may be selective or non-selective depending upon differential wetting, differences in cuticle, leaf arrangement, and location of buds. A non-selective contact herbicide will kill all vegetation with which it comes into contact. Grasses, which have their growing points below the soil, will frequently be more resistant to contact herbicides than broadleaf plants which have their buds exposed at the end of branches. Petroleum oils are often used as contact herbicides. Other chemicals used in horticulture are cocodylic acid, AMS, and paraquat. These chemicals are used as a "knock down" of unwanted vegetation.

Translocated herbicides can be absorbed by either roots or above ground parts, and are moved or translocated through the plant system. The chemicals upset the plant's growth and metabolic process. The wide range of chemicals available in this class, with the difference in sensitivity by various plant species, have made it possible to select a type and concentration of chemical for use against unwanted species without harming desirable species. Some are applied to the soil where unwanted seedlings absorb them in the process of germination. Others are applied to the foliage after emergence. Most of the important horticultural herbicides fall into this class of translocated herbicide and are widely used.

Chemicals used as herbicides are also frequently divided into inorganic or organic classes. Inorganic herbicides contained in Bulletin No. 564 include AMS, boron compounds, borates, chlorates, and arsenates. However, the majority of herbicides used are organic chemicals and a further classification of this group can be made based on chemical formulation. A classification scheme for the important chemicals used in horticulture is included in Appendix A.

A third type of classification can be made according to the timing of application in relation to the weeds or the crop, such as preplant, preemergent, or postemergent.

Another classification which has recently become important concerns the toxicity of the chemical. The class of toxicity is required to appear on the label of the herbicide container as "danger-poison," with a skull and cross-bones for those that are highly toxic. A "warning" for those which are moderately toxic, and "caution" for those slightly toxic. Those with very low toxicity are not required to be so labeled.

A large number of publications are made available to users of herbicides in an attempt to provide timely information. Pesticide Handbook — Entoma (4), which is used by some as a standard reference, is updated annually and contains extensive information on pesticides. A companion publication, the Pesticide Index (5) provides the chemical nomenclature, structural formula, toxicity, formulations, melting point, solubility, and use of each pesticide available for use. The International Plant Protection Center publication (6) cross indexes herbicides

by common name, trade name, chemical name and manufacturer.

Chemicals registered for use on food crops are listed by crop.

The Weed Science Society of America has published handbooks of herbicides (7) and issues quarterly publications on weed control.

The Meister Publishing Company, publishers of The American Fruit Grower and The American Vegetable Grower, prepares a herbicide guide (3) for sale to growers which attempts to include all registered uses.

United States Department of Agriculture (U.S.D.A.) and State Experiment Station bulletins are available (15)(8).

These are just a few of the sources of herbicide information found during the survey.

Section 3

RESIDENTIAL-HOMEOWNER USES OF HERBICIDES

Recommendations

Extension. Publications are available through the County Agricultural Extension Offices and the Distribution Center at Kansas State University which contain recommendations for the use of herbicides in the production of horticultural plants. These recommendations are a part of publications pertaining to a specific crop, such as Lawns in Kansas, Growing Strawberries in Kansas (10), or Growing Tomatoes in Kansas (9), and are also included in the publication Chemical Weed Control in Horticultural and Forestry Plants (8) which consolidates all of the herbicide recommendations.

The Sedgwick County Horticultural Extension agent makes recommendations on the use of herbicides through contacts with homeowners, by the distribution of literature, and by articles prepared for publication in the local newspaper. He makes contact with the garden centers and nurserymen to distribute extension bulletins. He has participated in training sessions for the sales personnel from garden centers and nurseries on problem diagnosis and treatment. Since lawn weeds are of particular importance to residential users, his primary extension bulletins are U.S.D.A. Home and Garden Bulletin No. 123, Lawn Weed Control with Herbicides (16), and North Central Regional Extension Publication No. 26, Lawn Weeds and Their Control (14). A

mimeographed tip sheet is also used which covers the most common local turf weeds.

The Sedgwick County Experimental Field is a source of information through their field days and published research reports.

The Wichita Eagle and Beacon publishes Extension information pertaining to herbicides from time to time in its Sunday gardening column. The garden editor works closely with Extension personnel.

Wholesale Suppliers. The personnel of the major wholesale suppliers of residential herbicides in Sedgwick County are very active and well informed. They act as screening agents in choosing which particular herbicide formulations to recommend to their customers, the retail sales outlets. These recommendations tend to be passed on to the final purchaser. All office employees of the wholesale suppliers have taken the examination required for pesticide application in the state of Kansas.

Retail Suppliers. The most important source of recommendations for residential users of herbicides is the retail sales clerk. Customers rely upon the knowledge and experience of sales personnel for guidance in selecting a proper herbicide. The quality of the recommendation can vary depending upon the knowledge of the sales personnel and the herbicides which they have available. During the survey these variances were apparent.

Garden centers tend to have a large variety of products from which to recommend, while the nurseries surveyed tend to

limit their stock and recommendations to a few choices.

Other Sources. Herbicide advertising is aimed at the homeowner from several sources. The Gard'n-Wise stores have a weekly television program which gives recommendations for applying herbicides. Local newspaper advertising is timed to coincide with effective application dates. The Scotts Company distributes an informative publication to many homeowners on the use of their products. There are undoubtedly many other ways in which homeowners come into contact with recommendations for the use of herbicides.

Availability of Herbicides

Wholesale Suppliers. Two distributors, George Wise Co. and Bartles and Shores Chemical Co. are the major local wholesale distributors of herbicides destined for residential use. They distribute Ortho, Fert'l-lome, Amchem, Acme, Science, and Pax lines. Each line offers multiple formulations and package sizes.

Scott's products are distributed from Kansas City by the Scotts organization.

House brands, such as K-Mart, Sears and Roebuck, and Montgomery Ward are distributed from area warehouses.

Retail Suppliers. There are an estimated 175 to 200 retail sales outlets in Sedgwick County supplying herbicides for residential use. They include garden centers, nurseries, discount stores, elevators, supermarkets, and service stations. The range of selection observed during the survey went from multi-line

multi-formulation, multi-package size at the garden centers, to three pints of Ortho "Weed-B-Gone" in a service station.

Garden centers surveyed carried the most complete and redundant selection of herbicides. Nurseries tended to be more selective, limiting the choices to those the nurseryman felt were adequate. In one instance, the nursery carried three phenoxy formulations, one for low temperature application, one for high temperature use, and one formulated with Banvel-D for particularly tough jobs. Two of the nurseries carried only one liquid phenoxy formulation, one being a mixture of 2, 4, 5-T and Banvel-D, and the other a mixture of 2, 4-D and 2, 4, 5-T. Some outlets carried only the Ortho line which provides a broad coverage of post-emergent herbicides.

Pax 3 year crabgrass control was the only herbicide found available to the residential user which carried a Danger-Poison label. It is thought to be more effective by some of the retail suppliers, although other less toxic formulations are more widely sold by most suppliers.

2, 4, 5-T is widely available and falls within the "moderately toxic" class of pesticides.

Application of Herbicides

Types Applied. The major use of herbicides by homeowners is for weed control in lawns. Preemergent herbicides are generally applied in late winter and consist of granular formulations of DCPA, trifluralin, bensulide, siduron, and arsenate of lead plus arsenous oxide. DCPA is the active ingredient in four of the

twelve formulations found in the survey. Nine of the twelve formulations also included fertilizers.

Postemergent herbicides for turf are used in both granular and liquid forms. Granular forms contain dicamba, 2, 4-D, and silvex. Nine formulations were found in the survey.

Liquid forms of postemergent herbicides for turf are available in varied proportions of 2, 4-D, 2, 4, 5-T, dicamba, and silvex. Several combinations of formulations and package sizes are available.

DCPA in a 75% wettable powder is available for use in residential turf applications although suppliers indicated little use. For use in flower beds and gardens, DCPA in wettable powder and in granular form, and trifluralin granules are offered.

Cacodylic acid, AMS, 2, 4-D, borates, chlorates, dalapon, bromacil, and amitrole are some other chemicals formulated for use by homeowners.

Methods of Application. Preemergent granules and post-emergent granules are usually applied by hopper spreaders which are commonly available. Some suppliers loan these to customers when they purchase the herbicide. Liquid postemergent chemicals for turf are generally applied by hose-end sprayers. Most suppliers have these available in several models. A smaller amount of the herbicides are applied by methods such as cane tubes, wax bars, aerosol cans, and compressed air sprayers.

Amounts of Herbicides Used. The two major wholesale distributors in the Sedgwick County area sell approximately 5,000

bags of preemergent turfgrass herbicides in a season. One large discount store surveyed accounts for 1,000 bags. By estimating amounts from other distributors and from house brands, it seems likely that 12,000 to 15,000 bags are sold in Sedgwick County. This would give coverage of approximately 30,000,000 square feet of turf.

Granular postemergent herbicides are applied primarily in combination formulations with fertilizers. Suppliers estimated that more herbicide would be applied in this form than in the preemergent granular form.

Liquid formulations of postemergent phenoxy herbicides were estimated to be applied at 30 to 40 times the quantity of the granular formulations. This would equate to 15,000 to 20,000 acres of residential turf receiving this type of herbicide.

Effectiveness of Herbicides

Extension Viewpoint. Preemergent herbicides applied to lawns is viewed as an effective, useful practice in the maintenance of turf grass. Use of phenoxy herbicides is thought by some to be overdone and damage to other plant materials frequently occurs. Completely safe application is difficult under conditions in which the homeowner has to work. Wind, high temperatures, relatively small areas, and crude application equipment are all limiting factors to good application. Many problems are brought to extension personnel from damage by phenoxy herbicides, but most damage probably goes undiagnosed or ignored.

Preemergent herbicides in gardens and shrub beds could be

more widely used. Problems with proper application and understanding of the action of the herbicide are limiting factors.

Supplier Viewpoint. Herbicides are necessary for satisfactory turf. No supplier surveyed saw problems from phenoxy herbicides as being significant. Some of the suppliers actively attempt to influence the type of application equipment for safe use of herbicides. A difference in philosophy was found between suppliers as to the use of the more effective arsenic type of herbicide vs. the shorter life less hazardous type of herbicides. The trend is to the less hazardous materials.

Relative Costs

Granular preemergent herbicides found in the survey are shown in Table 2. Granular postemergent types are in Table 3. Any cost comparisons must account for all ingredients in the formulation, many of which include fertilizers.

A compilation of other herbicides found available is contained in Table 4.

Table 2
Granular Preemergent Herbicides

<u>Name</u>	<u>Formulation</u>	<u>Amt.</u>	<u>Coverage</u>	<u>Cost</u>
Scotts Halts Plus	6.2% bensulide 20-5-5	11#	2,500 ft.	\$ 7.95
Scotts Halts Plus	3.1% siduron 16-21-5	11#	2,500 ft.	7.95
Scotts Shrub & Tree Weed Pre- venter	0.68% trifluralin 20-4-8	20#	--	7.95
Pax Crabgrass	8.25% arsenate of lead 25.11% arsenous oxide 4% N	40#	2,000 ft.	11.98
Super Pax	3.28% DCPA .656% heptachlor 11-2-2	14#	2,000 ft.	7.98
Fert'l Lome	2% DCPA 4% N	30#	2,500 ft.	6.95
Co-op Big 3	2% DCPA + fertilizer			
Vigoro Rid	2.3% DCPA	20#	2,000 ft.	3.76
Vertigreen	siduron		2,500 ft.	9.00
Greenfield Preen	1.47% trifluralin	15#	2,500 ft.	5.95
Greenfield Trebl	2.4% siduron 16-8-4	27#	5,000 ft.	13.95
Greenfield Crabbi- cide	0.63% benefin 16-8-4	27#	5,000 ft.	11.95

Table 3

Granular Postemergent Herbicides

Name	Formulation	Amt.	Coverage	Cost
Ortho-Gro	4.35% dicamba	16 $\frac{1}{2}$ #	3,000 ft.	\$ 7.95
	1.70% chlordanes	33#	6,000 ft.	14.50
	.9-3-3 plus iron			
Ortho	.95% 2, 4-D	27 $\frac{1}{2}$ #	5,000 ft.	6.95
	.45% silvex	55#	10,000 ft.	13.50
	21-4-4 plus iron			
Scotts Turf Builder	1.6% 2, 4-D	41#	10,000 ft.	14.95
Plus 2	22-5-5	61 $\frac{1}{2}$ #	15,000 ft.	19.95
Pax Action	.87% 2, 4-D	22#	5,000 ft.	7.98
	.0125% dicamba			
	18-4-4			
Pax Total	4 herbicides	16#	2,000 ft.	9.98
	10-6-4 S, Fe, Mn, Zn			
Fert'l Lome	.1062% dicamba	40#	3,000 ft.	4.95
	.311% 2, 4-D			
Weedone	2.67% 2, 4-D	18#	11,000 ft.	6.95
	1.33% silvex			
K-Mart Weed & Feed	2, 4-D	20#	5,000 ft.	2.03
Greenfield Two-Way Green Power	1.87% 2, 4-D	36#	10,000 ft.	13.45
	24-6-6			

Table 4
Other Herbicides for Residential Use

<u>Name</u>	<u>Formulation</u>	<u>Pkg. Size</u>	<u>Price</u>
<u>Ortho</u>			
Weed-B-Gone	17.8% 2, 4-D 8.4% 2, 4, 5-T	Gal., qt. Pt., $\frac{1}{2}$ pt. Aerosol Wax bar	\$ 7.98, 2.98 1.98, 1.39 1.98 4.98
Chickweed & Clover Killer	13.8% silvex	Qt., pt.	4.79, 2.98
Crabgrass & Dande- lion Killer	8.16% 2, 4-D 8% DSMA 8% MSMA	Gal. Pt.	9.88 2.69
Poison Ivy Spray	1.5% 2, 4-D	19 oz. aero.	1.98
Triox Vegetation Killer	Pramatol + 2 phenols	Gal., qt.	4.87, 1.59
Triox Vegetation Killer	Borate, chlorate, simazine	3#, $1\frac{1}{2}$ #	3.49, 1.98
Brush Killer A	43% AMS	Gal., qt.	8.69, 3.25
Spot Weed Killer	.44% paraquat 15% petr. oil	Aerosol	1.98
Garden Weeder	1.396% chloramben	$1\frac{1}{2}$ #	1.49
Weed & Feed	0.37% trifluralin 8-24-8		1.98
Dowpon	85WP	1#, 5#	2.60, 7.00
<u>Fert'l Lome</u>			
Broad Spectrum Weed Killer		Qt.	3.49
Spot Weed Killer	.74% 2, 4-D	Aerosol	1.98
Vegetation Killer	25% sodium chlorate		1.69
MSMA	13.2% MSMA	Gal.	9.98
Permatrim	12% AMS	Gal.	4.98

Table 4 (Continued)

<u>Name</u>	<u>Formulation</u>	<u>Pkg. Size</u>	<u>Price</u>
<u>Fert'l Lome (Cont'd)</u>			
Nutgrass & Weed Killer	2.4% MSMA	Gal.	\$ 4.98
Dacthal	2.4% G	1#	1.98
<u>Amchem</u>			
Weedone	2, 4, 5-T	Qt.	3.69
Super-D Weedone	2, 4-D + dicamba	Gal., qt. Pt., $\frac{1}{2}$ pt.	6.98, 2.98 1.69, 1.19
Nu Lawn Weeder	8.4% Bromoxynil	Pt.	2.49
Weedone Chickweed Killer	12.8% silvex	Qt., pt.	4.25, 2.49
Weedone BK-32	11.0% 2, 4, 5-T 22.8% 2, 4-D	Qt.	4.25
X-All	1.01% amitrole 3.02% simazine	Qt.	2.98
<u>Acme</u>			
Weed No More	14% 2, 4-D 4.3% silvex	Qt., pt. $\frac{1}{2}$ pt.	2.98, 1.98 1.29
Weed Killer	5.2% sodium cacodylate .9% dimethyl arsenic acid	Gal., qt.	-- 1.79
<u>Gordons</u>			
Broadleaf & Dandelion Killer	21.9% 2, 4-D 0.8% dicamba	Gal.	7.98
Nutgrass Killer	16.6% MSMA	Qt., pt.	3.98, 2.29

Table 4 (Continued)

<u>Name</u>	<u>Formulation</u>	<u>Pkg. Size</u>	<u>Price</u>
<u>Others</u>			
Phytar 560	2½#/gal.	5 Gal. Gal., Qt.	\$ 4.80/Gal. 7.65, 3.75
Hyvar X			
Dowpon	85WP	5#, 1#	7.25, 2.60
Ammate	Crystals	60#	13.44
Amitrole		Qt., pt.	4.95, 2.95
Karmex	80 WP	4#	24.95

Section 4

COMMERCIAL USERS OF HERBICIDES

Nursery Stock Production

Recommendations for Use. Recommendations for herbicides in ornamental production are published in Kansas Agricultural Experiment Station Bulletin No. 564 with comments on particularly important factors of use. Extension personnel are active in the Kansas Nurserymen's Association and contribute recommendations through their meetings and publications. Herbicide trials are conducted on a group of ornamentals to obtain data for use in making recommendations.

Herbicide suppliers are in contact with growers of nursery stock and their recommendations and product information data are available to the growers. Informative articles and advertisements in trade publications are another source of information.

It was apparent that each grower had his own criteria for the application of herbicides on nursery stock. Several growers indicated that various herbicides have been used in the past with weak and strong points. The growers surveyed felt they had arrived at a herbicide program based on their own experience.

Availability. Herbicides being used by nursery stock producers are available through the local suppliers. The growers

surveyed are also engaged in retail sales and utilize the same sources of supply. Principal types being used by those contacted are dichlobenil, diphenamid, and trifluralin.

Application. Three of the six nursery stock producers contacted are using herbicides. Two indicated that several different chemicals have been used in the past and each has settled on one chemical fitting their operations. One grower used atrazine and simazine but felt he had some problems with them. Dichlobenil caused some damage to junipers. He is now using trifluralin granules on all ornamentals, shade trees, fruit trees, and conifers. He applies it with a cyclone spreader over the top of the stock using twice the recommended rate but does not incorporate it at that time. Later in the season he cultivates in the row. He gets good grassy weed control with this method with an estimated cost of \$20 per acre.

Another grower has settled on diphenamid and uses both granular and wettable powder formulations. It is satisfactory for the total range of stock the grower is producing. It requires no incorporation, which is a strong factor. The third grower using herbicides is broadcasting dichlobenil.

Effectiveness. Herbicides are a valuable tool in production of nursery stock and can eliminate labor costs if production is large enough. Sedgwick County growers expressed a desire for a broad spectrum herbicide which can be used on all ornamentals being produced. They want a herbicide which is easy to apply and which does not require incorporation. Cost is also an important

consideration.

Three producers with less than four acres of nursery stock did not indicate any intention to change from their present method of cultivation for weed control.

Relative Costs. Table 5 gives the relative costs of the recommended herbicides for nursery stock, based on recommended rates and costs obtained from local suppliers.

Turf Production

Recommendations. A number of publications are available at the state and regional level dealing in weed control for turfgrass. Herbicide trials are conducted by extension personnel for evaluation on Kansas turfgrass in the Kansas environmental conditions. Extension personnel are active in organizations such as the Central Plains Turfgrass Foundation which helps to transmit herbicide information to growers.

Technical data is available from suppliers on the various chemicals available.

Availability. Turfgrass herbicides are readily available from local suppliers. The same chemicals are used by golf courses and institutional users so the potential sales volume is large enough to warrant considerable effort by suppliers to serve this market.

Application. The three turfgrass producers contacted are using DCPA for preemergent weed control and one of the phenoxy herbicides for postemergent control, one grower indicated Banvel D

Table 5
Relative Costs of Herbicides for Nursery Stock

<u>Herbicide</u> <u>AI/A</u>	<u>Formulated</u> <u>Product/A</u>	<u>Cost</u>	<u>Cost/A</u>
Simazine 2 to 3	Princep 80W 2½ to 3 ¾ lb. 4G 50 to 75 lb.	\$2.10/lb. \$.42/lb.	\$ 5.25 - \$ 7.87 \$21.00 - \$31.50
Dichlobenil 4 to 6	Casoron 50W 8 to 12 lb. 4G 100 to 150 lb.	\$4.40/lb. \$.49/lb.	\$35.20 - \$52.80 \$49.00 - \$73.50
DCPA 10 to 12	Dacthal 75W 14 to 16 lb. 5G 180 lb.	24# \$25.50 .175/lb.	\$14.84 - \$16.96 \$31.50
Cacodylic Acid 2½ to 5 lb.	Phytar 560 1 to 2 gal. 100 gal. water	\$4.80/Gal.	\$4.80 - \$ 9.60
Dalapon 4	Dowpon 85W 5 lb. 100 gal. water	\$.99/lb.	\$ 4.95
Trifluralin ½ to 4 lb.	Treflan 5G 10 to 80 lb.	\$.39/lb.	\$ 3.90 - \$31.20
Diphenamid 4 to 6 lb.	Dymid 5G 80 to 120 lb.	\$.294/lb.	\$23.52 - \$35.28
6 to 8 lb.	Enide 50WP 12 to 16 lb.	\$2.10/lb.	\$25.20 - \$33.60

plus Silvex. Benefin and trifluralin have been used in the past.

Boom sprayers are used to apply herbicides on turfgrass.

Effectiveness. Herbicides are very effective in production of weed free sod. Several chemicals are available. Cost is an important factor.

Relative Costs. Table 6 shows the relative costs of herbicides recommended for turfgrass.

Fruit Crop Production

Recommendations. Several extension publications are available which contain recommendations for approved herbicides in fruit crops. Extension personnel are active in the Kansas Fruit Growers Association and the Kansas Nut Growers Association and provide information through these organizations. Many personal contacts are made with growers in Sedgwick County, and herbicide demonstration plots are maintained in producing orchards.

The Sedgwick County Experimental Field initiated herbicide trials on apples, peaches, and strawberries in 1972. Results from these trials will be made available to growers.

Technical information on chemicals is available from herbicide suppliers; however, the survey did not reveal a high degree of activity by the suppliers because of the limited market potential.

Growers tend to wait until a herbicide is demonstrated to their satisfaction before using it themselves because of the severe penalty if damage occurs.

Table 6
Relative Costs of Herbicides for Turf Production

<u>Herbicide</u> <u>lb AI/A</u>	<u>Formulated Product/A</u>	<u>Formulated Prod.</u> <u>Cost</u>	<u>Cost/A</u>
<u>Preemergent</u>			
Benefin 1½ to 2	Balan 2½G 60 to 80 lb.	\$.158/lb.	\$ 9.48 - 12.64
Terbutol 12	Azak 80W 15 lb. 5G 240 lb.		
Bensulide 10 to 12	Betasan 4E 2½ to 3 gal. 12.5G 80 to 96 lb.	17.40/gal.	43.50 - 52.20
DCPA 10	Dacthal 75W 13.5 lb. 5G 200 lb.	24# 25.50 .175/lb.	14.30 35.00
Siduron 8 to 12	Tupersan 50W 16 to 24 lb.	2.12/lb.	33.92 - 50.88
<u>Postemergent</u>			
DSMA 4 9/10	Ansar DSMA liquid 4 lb. - 1 9/40 gal.	2.05/gal.	2.50
MSMA 2	Ansar 529HC 4 lb ½ gal.	2.55/gal.	1.28
2, 4-D 2 to 4	2, 4-D 4L ½ to 1 gal.	3.40 - 4.35/gal.	1.70 - 4.35
Dicamba 2	Banvel 4S-E ½ gal.	26.50/gal.	13.25
2, 4, 5-T 2 to 4	2, 4, 5-T 4L ½ to 1 gal.	9.97/gal.	5.00 - 9.97

Trade publications, such as The American Fruit Grower, are other sources of information on the use of herbicides.

Availability. The herbicides being used are readily available from local suppliers.

Application. Five fruit producers were interviewed. On tree fruits, one indicated no herbicides were used. Two are using simazine and paraquat. One is using terbacil, and one is using paraquat only. All use cultivation between rows.

Two growers are producing strawberries. One uses DCPA for weed control, applying it spring and fall. The other controls weeds by three hand cultivations per season.

Boom sprayers are the most commonly used method of applying herbicides. One grower is applying postemergent herbicides by a gun type hydraulic sprayer.

The total amount of herbicide being used by fruit growers is small. One major supplier estimated his total sales to this market at less than \$300 annually.

Effectiveness. Extension personnel feel that herbicides could be used more widely than they are at present. Demonstration trials are being maintained to help evaluate and expand their use. New chemicals are being evaluated as they are approved.

Growers are cautious about using herbicides. Some damage has reportedly occurred in the past from the use of simazine. Growers in Sedgwick County are generally working on sandy soils which make herbicides potentially more damaging to tree crops. Some past attempts at the use of herbicides in strawberry production has been discouraging.

Some growers indicated their intention to increase their use of herbicides in their operations and some indicated that they do not intend to do so.

Relative costs. Costs of herbicides for use in fruit crops are summarized in Table 7.

Vegetable Crop Production

Recommendations. Extension publications on production of specific vegetable crops, and Bulletin 564 are available to growers of vegetable products. Extension personnel are active in the Kansas Vegetable Growers Association and are able to give herbicide information through meetings and publications of that organization.

The Sedgwick County Experimental Field uses herbicides in the evaluation of some vegetable varieties which serve as a demonstration for those herbicides.

Technical information is available from herbicide suppliers on the chemicals which they have available. None of the suppliers contacted were particularly active in working with vegetable growers.

Trade publications such as the American Vegetable Grower publish articles and carry advertising relating to the use of herbicides in vegetable production.

Availability. The herbicides being used are available through the local suppliers, DCPA and trifluralin being the principal ones used. One grower indicated that an inquiry on

Table 7
Relative Costs of Herbicides for Fruit Crops

<u>Herbicide</u> <u>lb AI/A</u>	<u>Formulated Product/A</u>	<u>Formulated Prod.</u> <u>Cost</u>	<u>Cost/A</u>
<u>Tree Fruits</u>			
Paraquat $\frac{1}{2}$ to 1	Paraquat 1 to 2 qt. of 2 lb/gal. prod.	\$ 28.00/gal.	\$ 7.00 - 14.00
Dichlobenil 4 to 6	Casoron 50W 8 to 12 lb. 4G 100 to 150 lb.	4.40/lb. .49/lb.	35.20 - 52.80 49.00 - 73.50
Diuron 3 $\frac{1}{5}$	Karmex 80WP 4 lb.	2.30/lb.	9.20
Simazine 2 to 4	Princep 80W 2 $\frac{1}{2}$ to 5 lb.	2.20/lb.	5.25 - 9.50
Terbacil 1 $\frac{3}{5}$ to 3 $\frac{1}{5}$	Sinbar 80 WP 2 to 4 lb.	9.45/lb.	18.90 - 37.80
<u>Grapes</u>			
Diuron 1 $\frac{3}{5}$ to 4	Karmex 80WP 2 to 5 lb.	2.30/lb.	4.60 - 11.50
Simazine 2 to 4	Princep 80W 2 $\frac{1}{2}$ to 5 lb.	2.20/lb.	5.25 - 9.50
<u>Strawberries</u>			
Chloroxuron 4	Tenoran 50WP 8 lb.	1.95/lb.	15.60
DCPA 6 to 9	Dacthal 75W 8 to 12 lb.	24# 25.50	8.48 - 12.72
Diphenamid 4 to 6	Dymid 80W 5 to 7 $\frac{1}{2}$ Enide 50W 8 to 12 lb. Dymid 5G 80 to 120 lb.	2.10/lb. .294/lb.	16.80 - 25.20 23.52 - 35.28

naptalam and bensulide found that it was not locally available.

Application. DCPA is the primary herbicide used by vegetable growers. One of the larger growers uses it on sweet potatoes, peppers, Irish potatoes, tomatoes, cucumbers, and cabbage. He is using no herbicide on melons or sweet corn. A second grower uses DCPA on melons, tomatoes, and cucumbers, and none on sweet corn. A third grower produces tomatoes, egg plant and peppers with no herbicides being used. A new grower of tomatoes has used no herbicides in the past but indicates a desire to begin using them as his production expands. Another grower is using trifluralin on tomatoes and none on melons.

DCPA is the most widely used because it is broad spectrum, safe, and has a short residual. It is effective on crabgrass, the most common weed problem. With intensive cultivation and crop rotation, a herbicide with short residual is desired. Two growers expressed a need for an effective, short residual herbicide for use in sweet corn. A common method of using DCPA seems to be for cultivation of the crop early in the season, and application of the herbicide after plants are well established, with the expectation of 60-90 days of weed control.

Herbicides in vegetable crops are being applied broadcast with boom type sprayers. None of the growers are large producers of any one crop and specialized herbicide application equipment is not economically feasible.

The total amount of herbicide being used by vegetable growers is not large. One major supplier estimated the total annual potential sales in this market at \$500 to \$1,000.

Effectiveness. Extension personnel feel that herbicides can be more extensively used than they are. One of the limiting factors is that production is small by a given producer of a given crop. This may prevent the grower from giving as much specialized management attention, and using the specialized application procedures required. Herbicides are being more widely used in some other parts of Kansas than they are in the Sedgwick County area.

The growers expressed a need for a broad spectrum, safe, effective, short residual, easy to apply, low cost herbicide. The grower usually has one piece of application equipment for his operation. Calibration was indicated to be a problem by some growers. Growers producing a variety of crops tend to settle on DCPA. Growers of one or two specialty crops are more likely to use one of the other type herbicides. In general the growers expressed a desire to expand their use of herbicides.

Relative Costs. Table 8 shows the relative costs for the recommended herbicides applicable to the crops being grown in Sedgwick County.

Non-Cropland Weed Control

Recommendations. Bulletin No. 564 includes recommendations for control of weeds in non-crop areas. They are basically the same chemicals that are used by other users of herbicides for which recommendations are commonly available.

Availability. These chemicals are readily available from chemical suppliers.

Table 8
Relative Costs of Herbicides for Vegetable Crops

<u>Herbicide</u> <u>lb AI/A</u>	<u>Formulated Product/A</u>	<u>Formulated Prod.</u> <u>Cost</u>	<u>Cost/A</u>
<u>Snap Beans</u>			
Trifluralin	Treflan		
$\frac{1}{2}$ to $\frac{3}{4}$	4L 1 to $1\frac{1}{2}$ pt.		
	5G 10 to 15 lb.	\$.39/lb.	\$ 3.90 - 5.85
EPTC	Eptam		
3	6E $\frac{1}{2}$ gal.	13.75/gal.	6.87
	10G 30 lb.	.2975/lb.	8.92
Nitralin	Planavin		
$\frac{1}{2}$ to $1\frac{1}{2}$	4 1 to 3 pt.		
	75WP 1 $\frac{1}{3}$ to 2 lb.		
<u>Cucumbers, Muskmelons, and Watermelons</u>			
Naptalam	Alanap		
2 to 4	1 to 2 gal.	4.75/gal.	4.75 - 9.50
Bensulide	Prefar		
4 to 6	4E 4 to 6 qt.	17.40/gal.	17.40 - 26.10
<u>Potatoes</u>			
Diphenamid	Dymid		
4 to 6	80W 5 to $7\frac{1}{2}$ lb.		
	Enide		
	50W 8 to 12 lb.	2.10/lb.	16.80 - 25.20
	Dymid D		
	1 to $1\frac{1}{2}$ gal.		
DCPA	Dacthal		
$7\frac{1}{2}$ to $10\frac{1}{2}$	75W 10 to 14lb.	24# 25.50	10.60 - 14.84
<u>Sweet Corn</u>			
Alachlor	Lasso		
2 to 3	4E 2 to 3 qt.	12.50/gal.	6.25 - 9.38
	10 G 20 to 30 lb.	.50/lb.	10.00 - 15.00
Atrazine	Aatrex		
2 to 3	80W $1\frac{1}{2}$ to 3 $\frac{3}{4}$ lb.	2.25/lb.	3.37 - 8.50
	4L 4 to 6 pt.		

Table 8 (Continued)

<u>Herbicide</u> <u>lb AI/A</u>	<u>Formulated Product/A</u>	<u>Formulated Prod.</u> <u>Cost</u>	<u>Cost/A</u>
<u>Sweet Corn (Cont'd)</u>			
Propachlor 4 to 5	Ramrod 65WP 6 to 7½ lb. 20G 20 to 25 lb.	\$ 1.42/lb. .44/lb.	\$ 8.52 - 10.65 8.80 - 10.00
Simazine 2 to 3	Princep 80W 2½ to 3 ¾ lb.	2.10/lb.	5.25 - 7.87
<u>Sweet Potatoes</u>			
Diphenamid 4 to 6	Dymid 80W 5 to 7½ lb. Enide 50W 8 to 12 lb. Dymid D 1 to 1½ gal.	2.10/lb.	16.80 - 25.20
DCPA 7½ to 10½	Dacthal 75W 10 to 14 lb.	24# 25.50	10.60 - 14.84
Chloramben 3	Amiben 1½ gal.	8.65/gal.	12.98
<u>Tomatoes</u>			
Diphenamid 4 to 6	Dymid 80W 5 to 7½ lb. Enide 50W 8 to 12 lb. Dymid D 1 to 1½ gal.	2.10/lb.	16.80 - 25.20
DCPA 7½ to 10½	Dacthal 75W 10 to 14 lb.	24# 25.50	10.60 - 14.84
Bensulide 4 to 5	Prefar 4E 4 to 5 qt.	17.40/gal.	17.40 - 21.75

Application. A wide range of herbicides are used in control of weeds in non-cropland areas. Amitrole, AMS, cacodylic acid, dalapon, paraquat, and phenoxy type herbicides are used frequently. Phenoxy herbicides are used cautiously, or not at all, by nursery stock, fruit, and vegetable growers.

Herbicides in non-crop areas are most commonly applied by gun type or compressed air sprayers.

Excluding use of turfgrass, the total use of these herbicides by horticultural crop producers is relatively small.

Effectiveness. The use of herbicides in non-crop areas saves the grower much time in the maintenance of these areas. The growers surveyed indicated they are of great benefit.

Relative Costs. Costs of herbicides for non-crop use are listed in Table 9.

Table 9
Costs of Non-Cropland Herbicides

<u>Herbicide</u> <u>lb AI/A</u>	<u>Formulated Product/A</u>	<u>Formulated Prod.</u> <u>Cost</u>	<u>Cost/A</u>
<u>Contact Herbicides</u>			
Amitrole		\$ 12.00/gal.	
AMS 57 to 380 lb/100 gal. water	Ammate X or Ammate X-NI Crystals 60-400 lb/100 gal. water	60# 13.44	\$ 13.44 - 90.00
Cacodylic Acid 2½ to 5 lb/ 100 gal. water	Phytar 560 1 to 2 gal/100 gal. water.	4.80/gal.	4.80 - 9.60
Paraquat ½ to 1	Paraquat 1 to 2 qt of 2 lb./ gal. product	28/gal.	7.00 - 14.00
Dalapon 4 to 26	Dowpon 85WP 5 to 30 lb.	.99/lb.	5.00 - 30.00
MSMA	Numerous 3 to 6 qt. of 6 lb./ gal. product in 100 gal. water	2.55/gal.	1.92 - 3.85
2, 4-D or 2, 4, 5-T 2 to 4	Numerous 4L ½ to 1 gal.	3.40 - 9.97/gal.	1.70 - 9.97
<u>Soil Sterilants</u>			
Borate, Chlorate	Numerous	.13/lb.	
Bromacil 3 to 24	Hyvar XL 1½ to 12 gal.	16.00/gal.	24.00 - 192.00
Fenac 4½ to 18	Fenac 2 to 12 gal.		

Table 9 (Continued)

<u>Herbicide</u> <u>lb AI/A</u>	<u>Formulated Product/A</u>	<u>Formulated Prod.</u> <u>Cost</u>	<u>Cost/A</u>
<u>Soil Sterilants (Cont'd)</u>			
Diuron or Monuron 4 to 48	Karmex 80WP 5 to 60 lbs. Telvar 80WP 5 to 60 lbs.	\$ 2.30/lb. 2.50/lb.	\$11.50-138.00 12.50-150.00
Prometone 10 to 60	Pramitol 25E 5 to 30 gal.	6.00/gal.	30.00-180.00

Section 5

SUMMARY AND CONCLUSIONS

The largest horticultural use of herbicides in Sedgwick County is that involved in turfgrass. This includes the production of sod, the maintenance of golf courses and other public areas, and the battle of the weeds by homeowners. By comparison of volume used, no other horticultural use is in the same class. A fair estimate would be that turfgrass herbicides account for over 200 times the dollar value of sales as compared to herbicides used in nursery stock production, fruit production, and vegetable production combined. This is not to say, however, that herbicides are not important in other applications, but it does suggest the structure and sales effort of herbicide suppliers.

The greatest effort is in the sale of herbicides to homeowners in the care of the 90,000+ residential lawns in Sedgwick County. Dollar volume of residential sales can be thought of as roughly 20% in preemergent granular herbicides, 20% postemergent granular herbicides, and 60% postemergent liquid phenoxy herbicides. This is based on the comparison that granular is approximately 10 times the cost of liquid for a given area, and that 40 times as much liquid vs. granular is sold for residential lawns.

Granular herbicides are divided between several brand names; Fert'l-lome, Scotts, Pax, Vigoro, Co-op, Greenfield, Ortho, and others. The residential market on liquid phenoxy and small

package herbicides is dominated by Ortho. Other brands, but on a lesser scale, are: Fert'l-lome, Amchem, Acme, Science, Greenfield, Vertigreen, etc.

Growers of nursery stock, vegetables, and fruit crops are low volume users of herbicides. Limited acreage and limited applications both apply. The potential for expansion of horticultural crop production, the strong support of extension personnel, and the continuing high cost of labor should all be factors leading to the increased use of herbicides in the county.

The survey revealed that one limiting factor in the use of herbicides is proper application equipment. Residential application equipment is rather crude, and a high degree of tolerance must be built into the recommended rates to account for this fact. Better application equipment by commercial growers would give them greater confidence in the use of the more specialized herbicides which require greater accuracy. Some of the growers, being small, have limited pesticide application equipment, and do not feel highly confident of their ability to apply accurate rates.

Names of herbicides seem generally too complicated. The chemical name is required to appear on the label along with the brand name. The brand name on chemicals for homeowner use is likely to be a descriptive name like Scotts Turf Builder plus 2, Pax Action, or Vigoro Rid. Since most of us cannot read chemical names very well, and these descriptive brand names are used for sales purposes, a homeowner trying to evaluate his purchase based on its chemical content, is pretty well out of luck. A few of the

labels do carry a trade name for the chemical, such as Treflan, Dacthal, or Silvex, which gives the buyer more to go on. The common name, as approved by the Weed Society of America, is rarely included on a label.

Herbicides packaged for commercial users usually have the trade name along with the chemical name and users know most of the herbicides they use by the trade name. Common names are not commonly included on the label.

Costs for a given herbicide were found to be variable. For example, if a person has a 10' x 50' flower bed and would like to use DCPA at 10 lbs/Acre for weed control, some of his possible choices would be:

<u>Amount</u>	<u>Formulation</u>	<u>Available As</u>	<u>Cost for 500 ft.²</u>
5 lb.	2% granules	2 lb shaker can @ \$1.98	\$5.00
5 lb.	2% granules	30 lb bag @ \$6.95	\$1.30
4 lb.	2½% granules	1½ lb shaker can @ \$1.49	\$5.00
		4 lb shaker can @ \$3.98	\$5.00
4.35 lb.	2.3% granules	20 lb bag @ \$3.76	\$.82
2½ oz.	75WP	5 oz. pkg. @ \$1.98	\$1.00
		12½ oz. pkg. @ \$3.49	\$.70
		4 lb. pkg. @ \$7.80	\$.30
		24 lb. qty. \$25.50	\$.20

This example goes from the shaker cans, labeled "garden weeder" containing 2% or 2½% granules, at \$5.00 for 500 square feet, through the same product labeled "crabgrass preventer for lawns," at \$1.30 and \$.82 for 500 square feet, to three sizes of 75 WP available to residential users, and the 24 lb. quantity available to commercial growers.

Herbicides are useful, widely used, and sometimes overused. Prevention of weeds, in most cases, is preferable to removing weeds, and is the basis of most commercial herbicide programs. The ability to utilize them effectively provides opportunity for improvement.

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APPENDIX A

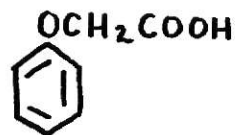
APPENDIX A

Common Names of Organic Herbicides by Major Chemical Groups

1. Without Nitrogen

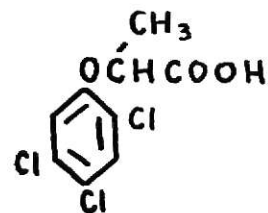
A. Phenoxyacetic Acids

2, 4-D
2, 4, 5-T



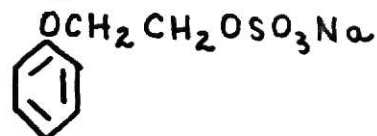
B. α - Phenoxypropionic Acids

Silvex



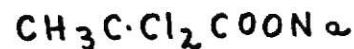
C. β - Phenoxyethyl

Sesone



D. Chlorinated Aliphatic Acids

Dalapon



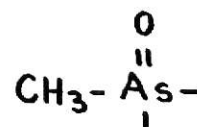
E. Phthalic Compounds

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Naptalan



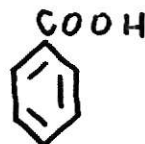
F. Metal Organic Compounds

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MSMA
Cacodylic Acid



G. Benzoic Acids

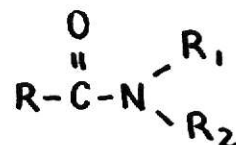
Dicamba
Fenac
Chloramben



2. Containing Nitrogen

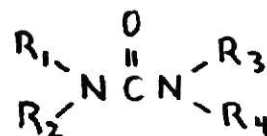
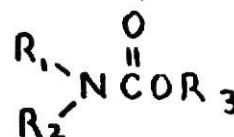
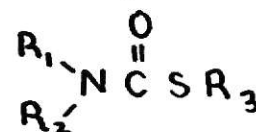
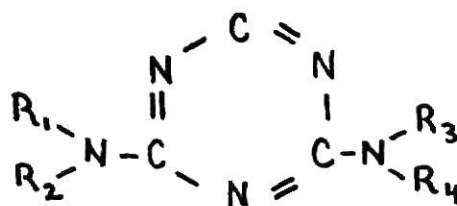
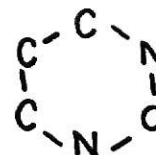
A. Amides

Diphenamid
Bensulide
Alachlor
Propachlor



B. Substituted Ureas

Diuron
Monuron
Linuron
Siduron
Chloroxuron

C. Carbamates
TerbutolD. Thiocarbamates
EPTCE. Triazines
Simazine
Atrazine
Prometone
SD-15418F. Bipyridylum Quaternary Salts
ParaquatG. Toluidines
Trifluralin
Benefin
NitralinH. Aminotriazoles
AmitroleI. Diazines
Bromacil
TerbacilJ. Benzonitriles
Dichlobenil

APPENDIX B

APPENDIX B

Costs of Herbicides Included in Bulletin 564

<u>Common Name</u>	<u>Trade Name</u>	<u>Form.</u>	<u>Cost</u>
Alachlor	Lasso	10G 4 EC	.50/lb. 12.50/gal.
Amitrole	Numerous		12.00/gal.
AMS	Ammate X	Crystals	.224/lb.
Atrazine	AAtrex	80W	2.25/lb.
Benefin	Balan	2.5G	.158/lb.
Bensulide	Betasan	4E	17.40/gal.
Bromacil	Hyvar XL	2 lbs/g	16.00/gal.
Cacodylic Acid	Phytar	2 lbs/g	4.80/gal.
Chloramben	Amiben, Vegiben	2 lbs/g	8.65/gal.
Chloroxuron	Tenoran	50WP	1.95/lb.
Dalapon	Dowpon	85WP	.99/lb.
DCPA	Dacthal	75WP 5G	1.06/lb. .175/lb.
Dicamba	Banvel	4S-E	26.50/gal.
Dichlobenil	Casoron	50WP 4G	4.40/lb. .49/lb.
Diphenamid	Dymid, Enide	5G 50WP	.294/lb. 2.10/lb.
Diuron	Karmex	80WP	2.30/lb.
DSMA	Ansar, Methar Sodar	4 lb.	2.05/gal.
EPTC	Eptam	6E 10G	13.75/gal. .2975/lb.
Fenac	Fenac	1½ lbs/g	
Linuron	Lorox	50WP	2.50/lb.

<u>Common Name</u>	<u>Trade Name</u>	<u>Form.</u>	<u>Cost</u>
MSMA	Ansar	4 lb.	2.55/gal.
Naptalam	Alanap	2 lbs/g	4.75/gal.
Nitralin	Planavin	4 lbs/g 75WP	
Nitrofen	TOK-E	2 lbs/g 50 WP	7.38/gal. 1.79/lb.
Paraquat	Paraquat	2 lb/g	28.00/gal.
Prometone	Pramitol	25E 5P	6.00/gal. .35/lb.
Propachlor	Ramrod	65WP 20G	1.42/lb. .441/lb.
SD-15418	Bladex	80WP	2.45/lb.
Siduron	Tupersan	50WP	2.12/lb.
Silvex	Numerous	4 lb.	10.24/gal.
Simazine	Princep	80W 4G	2.10/lb. .42/lb.
Sodium Chlorate	Numerous		.13/lb
Terbacil	Sinbar	80WP	9.45/lb.
Terbutol	Azak	80W	
Trifluralin	Treflan	4 EC 5G	.39/lb.
2, 4-D	Numerous	4 lbs.	3.40-4.35/gal.
2, 4, 5-T	Numerous	4 lbs.	9.97/gal.

Costs are based on February 1973 prices, and quantities of 5 gallons of liquid formulations and 20 to 40 lbs. of wettable powder formulations.

THE USE OF HERBICIDES IN HORTICULTURAL
APPLICATIONS IN SEDGWICK COUNTY, KANSAS

by

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AN ABSTRACT OF A MASTER'S REPORT

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requirements for the degree

MASTER OF SCIENCE

Department of Horticulture and Forestry

KANSAS STATE UNIVERSITY
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A study was conducted in Sedgwick County, Kansas to determine the use of herbicides in horticultural crops. The study was made by interviewing persons involved in the recommendation, sale, and application of herbicides. Results were summarized into two major classes, residential uses and commercial uses.

The maintenance of turfgrass by the 90,000+ homeowners in Sedgwick County accounts for the largest amount of herbicide used. About 200 retail suppliers serve this market. Local state, and regional publications provide recommendations for using herbicides in lawn maintenance. Retail sales personnel have the greatest influence on the selection of a herbicide. Garden centers tend to have a wide, often redundant, selection of herbicides in stock, while nurseries tend to have a narrower range of selections.

An estimate based on supplier information would suggest that 700 acres of residential turf are treated with granular preemergent herbicides, a slightly larger amount with granular postemergent herbicides, and 15,000 to 20,000 acres with liquid postemergent herbicides. Most granular forms are applied by hopper-spreader in combination with fertilizers. Liquid herbicides are commonly applied by hose end sprayer. Some extension personnel are concerned by phenoxy herbicide damage. Suppliers do not consider this a significant problem.

Nursery stock growers, fruit growers, and vegetable growers use herbicides to a limited extent. Cultivation is the

primary method of weed control. Factors limiting their use include potential crop damage, effectiveness of weed control, inadequate application equipment, herbicide residual effect, size of operation, and cost. Trifluralin, diphenamid, and dichlobenil were the herbicides reportedly used in nursery stock. Simazine, terbacil, and paraquat are the most commonly used in tree fruit, and DCPA in strawberry production. Vegetable growers are primarily using DCPA. The total amount being used in these three areas is small, amounting to less than \$2,000 sales annually by suppliers. Extension personnel are active in working with growers concerning the beneficial use of herbicides. Relative costs of recommended herbicides were compared during the survey.