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LIGHT AND COLOR RESPONSES OF APTEROUS
CEREAL APHIDS

BY
EUGENE LESLIE MILLER

A thesis submitted
in partial fulfillment of the requirements for the
degree Master of Science, Major in
Entomology, South Dakota
State University

1970

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LIGHT AND COLOR RESPONSES OF APTEROUS
CEREAL APHIDS

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Thesis Adviser/

Date

Head, Entomology-Zoology Department

Date

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ELM

TABLE OF CONTENTS

	Page
INTRODUCTION.....	1
REVIEW OF LITERATURE.....	2
MATERIAL AND METHODS.....	5
I. Performance Studies.....	6
II. Preference Studies.....	8
RESULTS AND DISCUSSIONS.....	13
I. Color Performance Studies.....	13
II. Color Preference Studies.....	14
CONCLUSIONS.....	20
REFERENCES CITED.....	21
APPENDIX.....	24

LIST OF FIGURES

Figure	Page
1 Spectral Transmission of Wratten Filters.....	7
2 Diagram of Cage Assembly for Confinement Studies.....	9
3 Diagram of Cage Assembly for Preference Studies.....	11

LIST OF TABLES

	Page
I. Constituents of Artificial Diet.....	25
II. Responses of Aphids Confined Under Two Similarly Colored Wratten Filters	
A. English Grain Aphids.....	26
B. Oat Bird-Cherry Aphids.....	28
C. Greenbugs.....	30
D. Corn Leaf Aphids.....	32
III. Responses of Aphids Confined under Colored Wratten Filters	
A. English Grain Aphids.....	34
B. Oat Bird-Cherry Aphids.....	36
C. Greenbugs.....	37
D. Corn Leaf Aphids.....	39
IV. Responses of Aphids Confined Under Neutral Density Wratten Filters	
A. English Grain Aphids.....	41
B. Oat Bird-Cherry Aphids.....	42
C. Greenbugs.....	43
D. Corn Leaf Aphids.....	44
V. Preference of Aphids Under Colored Wratten Filters	
A. English Grain Aphids.....	45
B. Oat Bird-Cherry Aphids.....	46
C. Greenbugs.....	47
D. Corn Leaf Aphids.....	48
VI. Preference of Aphids Under Neutral Density Wratten Filters	
A. English Grain Aphids.....	49
B. Oat Bird-Cherry Aphids.....	50
C. Greenbugs.....	51
D. Corn Leaf Aphids.....	52
VII. Preference of Aphids Under Colored and Neutral Density Wratten Filters	
A-1. English Grain Aphids under Green.....	53
A-2. English Grain Aphids under Yellow.....	54
A-3. English Grain Aphids under Red.....	55
A-4. English Grain Aphids under Blue.....	56
B-1. Oat Bird-Cherry Aphids under Green.....	57
B-2. Oat Bird-Cherry Aphids under Yellow.....	58
B-3. Oat Bird-Cherry Aphids under Red.....	59
B-4. Oat Bird-Cherry Aphids under Blue.....	60

LIST OF TABLES, CONTINUED

	Page
C-1. Greenbugs under Green.....	61
C-2. Greenbugs under Yellow.....	62
C-3. Greenbugs under Red.....	63
C-4. Greenbugs under Blue.....	64
D-1. Corn Leaf Aphids under Green.....	65
D-2. Corn Leaf Aphids under Yellow.....	66
D-3. Corn Leaf Aphids under Red.....	67
D-4. Corn Leaf Aphids under Blue.....	68

INTRODUCTION

Four species of cereal aphids, Macrosiphum avenae (Fab.), Rhopalosiphum padi (L.), Schizaphis graminum (Rondani), and Rhopalosiphum maidis (Fitch), occurring in South Dakota are distributed throughout the small grain growing areas of North America. They colonize on both spring and winter grains and are important as plant pests and disease vectors.

The objectives of this study were to investigate responses of apterous cereal aphids to light intensity and color, and to determine their specific light and color preferences.

Analyses of responses to light and color may have considerable practical importance in explaining host plant selection, in aphid trapping and collecting, and in aphid rearing techniques.

REVIEW OF LITERATURE

Most previous studies of color and light responses of homopterous insects showed that either color or light intensity was the primary factor influencing attraction to surfaces.

Kring (1966) demonstrated that yellow-sensitive aphids Brevicoryne brassicae (L.) and Myzus persicae (Sulzer) initially alighted in greatest numbers on white fluorescent lamps and, when exhausted, alighted on yellow cards. Kring (1967), on the basis of the results of color and light intensity studies, credited attraction to color vision of the aphids. Cartier (1966) noted that the potato aphid, Macrosiphum euphorbiae (Thomas), and the pea aphid, Acyrtosiphon pisum (Harris), responded to differences in wave lengths (color) and not to the available radiant energy (light intensity). Pospisil (1963) found that the alates of M. persicae were attracted to yellow and green light much more than to light of other colors, and that they maintained this reaction throughout their life span. Cartier and Auclair (1964) found that A. pisum, confined on chemically defined diets backlighted blue or white, survived only a few days, whereas they lived longer and grew more rapidly on the diet when backlighted orange or yellow.

Moore (1937) found that M. persicae was attracted to potato plants sprayed with Bordeaux mixture due to the increased intensity of light reflected from sprayed surfaces. He claimed that this proved that light intensity was the primary factor involved in attracting aphids. He also found that infestations of B. brassicae

could be reduced by dyeing the insecticide dust black, thereby reducing the amount of reflected light. Johnson, et al. (1967) demonstrated that aluminum foil and white polyethylene strips placed between rows of gladiolus plants were highly successful in repelling aphids due to the reflected light (light intensity).

Other previous investigators merely reported their observations and gave no indication of color or light intensity preferences. Cody (1941) found that A. pisum preferred dark, green-colored, garden peas over light, yellow-green-colored varieties. Kennedy, et al. (1961) observed alighting by B. brassicae and M. persicae in the field occurred preferentially on leaves reflecting a greater proportion of long-wave energy (yellow range) regardless of the host status of the plant for each aphid. Müller (1964) observed that yellow and yellow-green varieties of lettuce attracted greater numbers of aphids than did whitish-green and reddish-brown varieties. Moericke (1952) demonstrated that, in nature, winged forms of certain species of potato aphids were attracted to yellow surfaces. Wilde (1961), using sticky board traps of various colors, demonstrated that a majority of the psyllids, aphids, and leafhoppers he observed, selected yellow over white. Kelsheimer (1932) demonstrated that leafhoppers were attracted to colored electric light bulbs in the following order: ivory, green, brown, buff, red, and blue. He further stated that the bulbs were not corrected for light intensity, but that light intensity was a factor.

These studies were inadequate in several ways. In most cases

there were no accurate measurements of spectral transmission or light intensity. No attempt was made to standardize light intensity with color. In addition, statistical analysis of data was frequently lacking. In this study attempts were made to evaluate the influence of light intensity and color on the responses of cereal aphids under controlled environmental conditions.

MATERIALS AND METHODS

The four species of cereal aphids used in this study were the English grain aphid, Macrosiphum avenae (Fab.), the oat bird-cherry aphid, Rhopalosiphum padi (L.), the greenbug, Schizaphis graminum (Rondani), and the corn leaf aphid, Rhopalosiphum maidis (Fitch). Aphid colonies were maintained on barley CI 666 in the greenhouse. Only active adult apterae from the stock colonies were counted into the cages. All tests were run in Percival or Sherer controlled environment chambers operating from 20°C to 27°C, and with a photoperiod of 16 hours of light (3,000 Ft-c supplied by fluorescent and incandescent bulbs).

The complex synthetic diet used in this investigation was based on the nutritional studies of Mittler and Dadd (1962, 1963b, 1965b, 1965c); and on the diet formulated by Auclair and Cartier (1963) for the pea aphid, A. pisum, modified for use with cereal aphids by Kieckhefer and Derr (1967) (Table I). The Parafilm[®] (Marathon Corp.) feeding sachets used herein were based on the methods and procedures of Mittler and Dadd (1963a, 1964, 1965a). The diet-containing sachets were changed daily to enhance survival and reproduction.

KODAK[®] Wratten photographic filters provided light intensity and color gradients. The Wratten filters used were selected to represent discreet fractions of the visible spectrum and to be relatively stable under continuous exposure to light. In order to provide varying light intensities, various densities of Wratten filter No. 96 were used. The various densities of Wratten filter No. 96 transmitted different

percentages of light, but spectral transmission was identical at all densities (Fig. 1). Percent transmission of light by neutral density filters was as follows: 0.10 standard density filter, 80% transmission; 0.60 density, 25%; 1.00 density, 10%; and 3.00 density, 0.10%. To provide color gradients, KODAK filter number 15 (yellow), 26 (red), 29 (red), 49B (blue), and 53 (green) were used. Fig. 1 shows their spectral transmission. The colored filters transmitted varying percentages of light (tungsten light; color temperature 2854K) as follows: No. 15, 91.1%; No. 26, 19.1%; No. 29, 11.0%; No. 49B, 0.11% and No. 53, 8.1%. Other descriptive statistics about these Wratten filters are given by KODAK (1965). Spectrophotometric tests comparing new and used filters showed no deterioration of filters after a month's exposure to light.

This study was conducted in two phases: a performance phase, and a preference phase. In the performance phase, the aphids were confined under one neutral density or one color filter and their survival and reproduction observed. The performance phase was run with three sets of filters: neutral density, similarly colored and distinctly colored. In the preference phase, the aphids were allowed to feed under a neutral density or color filter of their choice, and their survival and reproduction observed.

I. Performance Studies

Cages for confining aphids were constructed by cutting cellulose nitrate tubing (2 cm in diameter) into 2 cm lengths. The bottom end of these lengths of tubing was closed with No. 88 silk bolting cloth

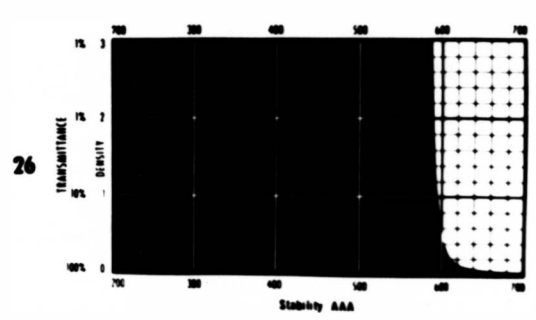
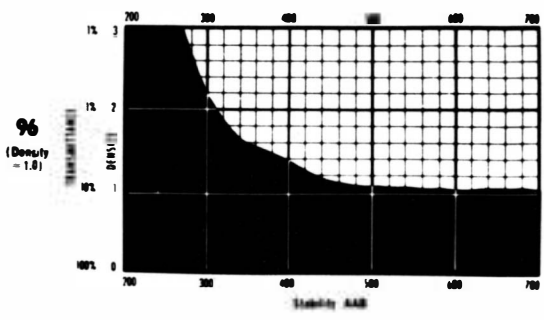
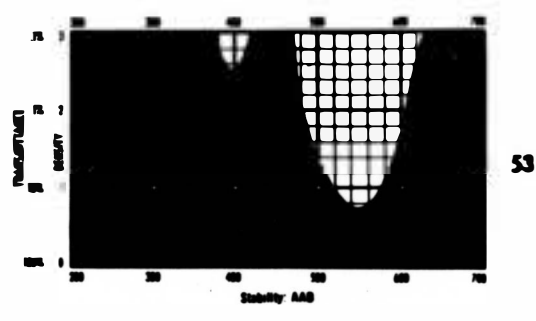
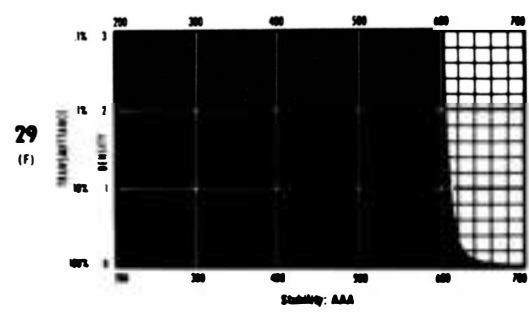
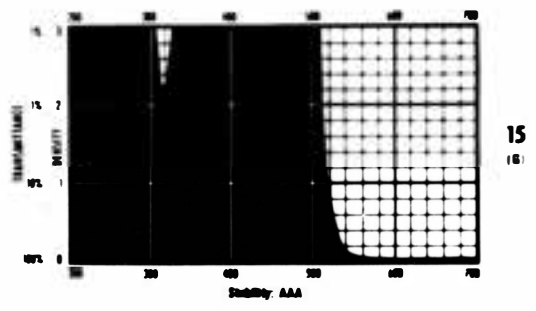
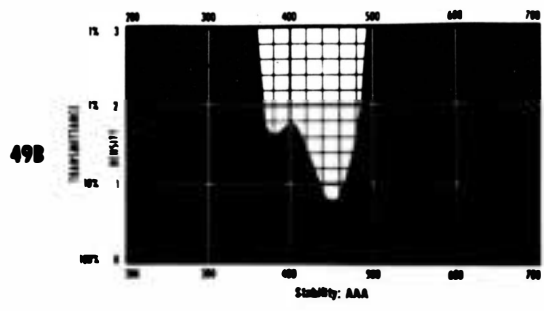


FIG. 1. SPECTRAL TRANSMISSION OF WRATTEN FILTERS

glued to the wall of the tubing with an acetone-cellulose nitrate solution. The tops of the cages were closed with a Parafilm sachet containing the synthetic diet solution. Sachets were formed by stretching a Parafilm membrane (to about 1/10 its original thickness) over the top of the tube, placing a 0.05 ml drop of diet solution on the taut membrane, and covering with another tautly stretched Parafilm membrane.

Twenty aphids were placed in each cage, and five such cages (representing replicates) were placed in aluminum foil-covered plastic dishes 9.5 cm in diameter x 3.5 cm in height. The aluminum foil reflected all side light so that only filtered light fell upon the confined aphids. Moist filter paper was used in the bottom of these dishes to increase humidity. Wratten filters were mounted against the inner top of a standard petri dish cover which covered the entire test chamber assembly (Fig. 2). A standard petri dish cover without a filter served as the control.

Daily tabulations over a 2 to 10 day period were made of the nymphs and of the number of aphids surviving from the original complement placed in each cage. Since difficulties were experienced in distinguishing between living and dead aphids on the floor of the cages, only individuals clinging to the Parafilm membrane or moving on the walls of the cages were tallied.

II. Preference Studies

The second phase of this study was similar to the first phase, except that the aphids were not confined to one filter. They were free to go to the filter of their choice to feed, resulting in aphid

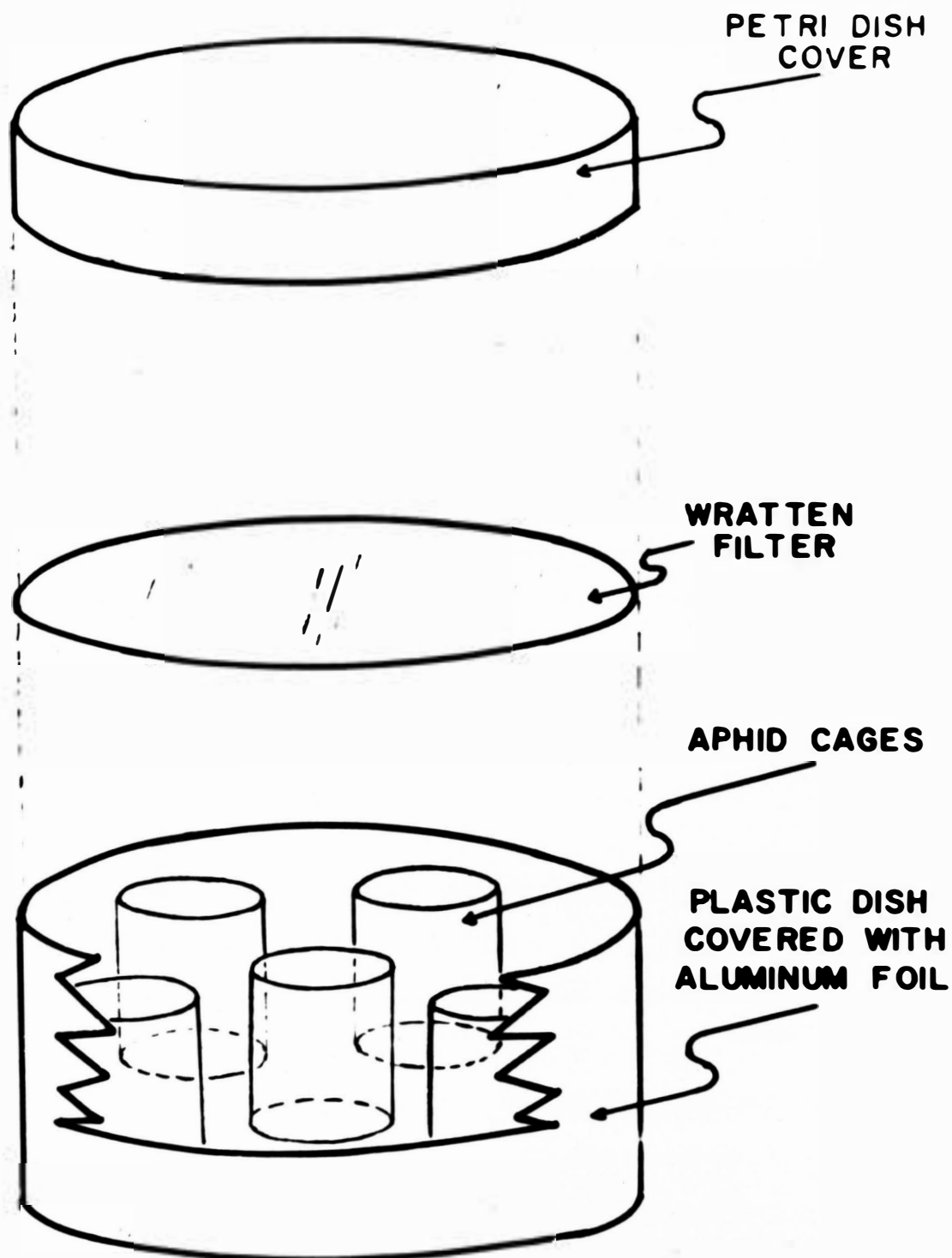


FIG. 2. CONFINEMENT STUDIES CAGE ASSEMBLY

light or color preference.

The preference chambers were built by covering a cylindrical half-pint waxed container (9.5 cm in diameter x 5 cm in height) with a plastic petri dish cover in which four holes had been drilled to receive 2 cm x 2 cm plastic tubing. This tubing was glued flush with the inner surface of the petri dish cover so that the aphids could move freely from turret to turret without encountering obstacles. Turrets were covered at the top with Parafilm feeding sachets containing the synthetic diet. The entire top of the assembly was covered with a glass petri dish cover divided into quadrants by the four different Wratten filters mounted against the inner top and aligned with the feeding turrets. Cardboard partitions excluded light from the adjacent quadrant (Fig. 3).

The same Wratten neutral density filter No. 96 used in the response studies was used in this study. The colored Wratten filters used in this study were the same as were used in the response studies with the exception of red filter No. 26 which was not used.

To distinguish between the influence of varying light intensities, tests were run with the four neutral density filters. Spectral preferences were determined by testing with the four colored filters. To distinguish between the influence of varying spectra and varying light intensity on aphid preference, tests of aphid survival and reproduction were run with a colored filter and three neutral density filters. Each of the four colors was placed singly with three neutral density filters. The three neutral density filters selected bracketed the color being

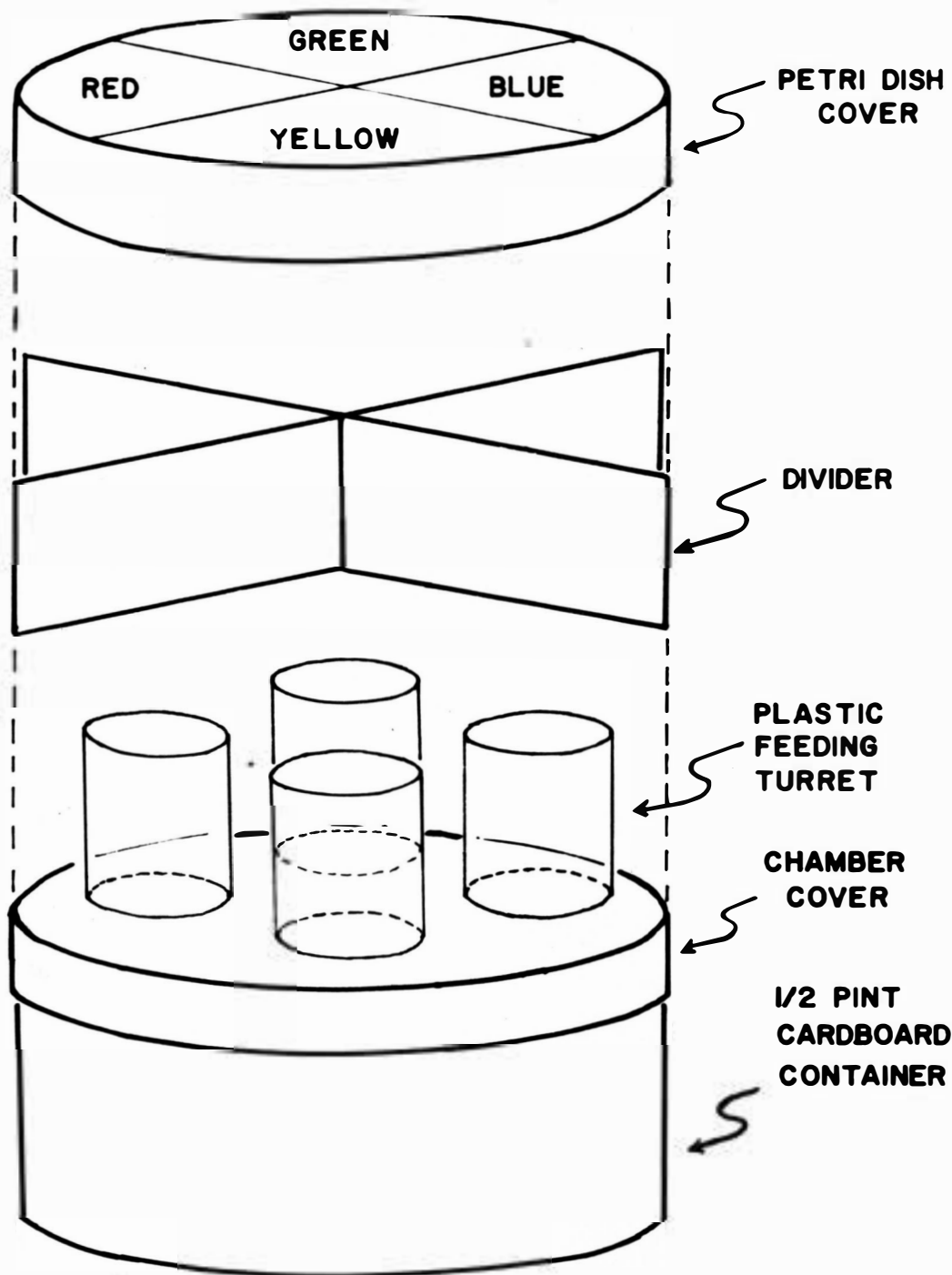


FIG. 3. PREFERENCE STUDIES CAGE ASSEMBLY

tested; that is, they allowed greater, less, and approximately the same light transmission as the color.

There were four preference chambers for each species, with 100 aphids placed in each chamber. Daily tabulations over a 2 to 5 day period were made of the nymphs and of the number of aphids surviving from the original complement placed in each chamber. Only individuals clinging to the Parafilm membrane or moving on the walls of the turrets were tallied.

The data obtained in these studies were statistically analyzed by the use of analysis of variance. The means were compared using Duncan's New Multiple Range test (Steel and Torrie, 1960).

RESULTS AND DISCUSSIONS

I. Performance Studies

The neutral density Wratten filters transmitted varying percentages of light within the visible spectrum (Fig. 1); however, variations in performance of cereal aphids confined under them were not readily distinguishable. Better survival and higher reproduction under the higher intensity filters were generally observed, although only a few responses of statistical significance were noted.

The adult apterae of the English grain aphid survived longer under the highest intensity filters, whereas reproduction was better under the lowest intensity filter (Table IV A). The survival of the oat bird-cherry aphid was similar under all filters. The reproduction of this species under these filters was so poor that no conclusions could be drawn (Table IV B). Both survival and reproduction of the greenbug were much greater under the highest intensity filter (Table IV C). The survival of the corn leaf aphid was significantly higher under the highest intensity filter at the beginning of the test, but no later trends were observed. Reproduction was best under the 0.60 filter, but was without statistical significance (Table IV D).

Colored Wratten filters transmitted only discreet fractions of the visible spectrum (Fig. 1), and variations in performance of cereal aphids confined under them were readily distinguishable. Differences in survival and reproduction by several species of aphids were recorded when they were confined under Wratten filters transmitting only slightly different spectra. Survival of the oat bird-cherry aphid was

significantly greater (0.01 level)(Table II B) and survival and reproduction of the English grain aphid was superior (Table II A) under filter No. 26 when compared with filter No. 29. Survival and reproduction of greenbugs and corn leaf aphids were similar under the two filters (Tables II C and II D).

Day to day survival of the English grain aphid under colored Wratten filters was significantly higher under yellow, than under green, red and the control which were similar, followed by blue. Reproduction was significantly higher under the yellow filter, with the other colors statistically indistinguishable (Table III A). Oat bird-cherry aphid survival was significantly greater under green, followed by yellow, red, control, and blue respectively. Reproduction of this species was similar under all of the colors (Table III B). Both the survival and reproduction of the greenbug was superior under yellow, with green, red, blue, and the control being statistically indistinguishable (Table III C). The survival of the corn leaf aphid was significantly higher under yellow, followed by green and red which were similar, and blue and the control which were also statistically indistinguishable. Reproduction was highest under yellow, followed by green, red, blue, and control which were all statistically indistinguishable (Table III D).

II. Preference Studies

Although variation in aphid performance when confined under neutral density Wratten filters was frequently lacking, intensity preferences or trends favoring the highest intensity neutral density filter were

shown by all four species of cereal aphids tested. A trend toward the highest intensity neutral density filter (0.10 standard density) was observed with the apterae of the English grain aphid. The nymphs also chose the highest intensity filter (0.01 level). The other three filters were statistically indistinguishable (0.05 level or 0.01 level) (Table VI A). Daily tabulations showed that the adult apterae of the oat bird-cherry aphid preferred (0.05 level or 0.01 level) the highest intensity filter during each day of the test. The other three filters were statistically indistinguishable (0.05 level or 0.01 level) except at 120 hours. The oat bird-cherry aphid nymphs also chose (0.01 level) the highest intensity filter. The other filters were statistically indistinguishable (Table VI B). The greenbug apterae preferred (0.05 level or 0.01 level) the highest intensity filter during each day of the test. The greenbug nymphs did not show any preferences until the 72 hour reading; from that time on they preferred (0.01 level) the highest intensity filter (Table VI C). Both the apterae and nymphs of the corn leaf aphid exhibited trends, with some statistical significance, in preferring the highest intensity filter, but the results were not as well defined as with the three other species (Table VI D).

Well defined color preferences were shown by all species of the cereal aphids tested. In every case, yellow or green were the preferred colors, with red and blue being less desirable. The adult apterae and nymphs of both the English grain aphid and the greenbug chose yellow (0.05 level or 0.01 level) followed by green, red, and blue (Table IV A and IV C). The adult apterae and nymphs of the oat

bird-cherry aphid preferred green (0.05 level or 0.01 level) over yellow, red, and blue (Table V B). The adult apterae of the corn leaf aphid chose yellow (0.05 level or 0.01 level), while the nymphs preferred green (0.05 level or 0.01 level) (Table V D).

Well defined preferences or trends favoring the various spectra over the various intensities were shown by all four cereal aphid species tested. Responses favoring yellow or green over the comparable neutral density filters were readily distinguishable in all cases. Responses with red and blue and the comparable neutral density filters were not well defined, but trends favoring the colors were noted. The English grain aphid apterae preferred (0.05 level or 0.01 level) green over any of the neutral density filters. The nymphs also preferred green to any neutral density filter during the first 48 hours. No significance was shown after that, but a trend toward green was still evident (Table VII A-1). Both the English grain aphid apterae and nymphs preferred yellow (0.05 level or 0.01 level) over any of the neutral density filters (Table VII A-2). Although the preference for red was not significantly greater than for the neutral density filters, a definite trend toward red was observed with the apterae, and to a lesser extent with the nymphs although reproduction was quite limited (Table VII A-3). The English grain aphid apterae exhibited no significant preference for blue or any of the neutral density filters, nor was any trend observed. Survival was poor, and the test was concluded after 72 hours. Reproduction was so poor under this series of filters that no comparisons

could be made (Table VII A-4).

Both the apterae and nymphs of the oat bird-cherry aphid showed a highly significant preference for green over any of the neutral density filters (Table VII B-1). Both the apterae and nymphs preferred yellow over any of the neutral density filters for the first 72 hours of the testing cycle. A trend toward yellow was observed at 96 hours and at 120 hours, but without statistical significance (Table VII B-2). The apterous oat bird-cherry aphids showed a highly significant preference to red only at 48 hours. Although no further preference was shown, a trend toward red was evident. The nymphs exhibited no significant preference toward red or any of the neutral density filters. Only a slight trend toward red was observed, and this was not consistent throughout the 120 hour testing period (Table VII B-3). The apterous oat bird-cherry aphids preferred blue and the 4.00 neutral density filter at 48 hours. Blue was preferred at 72 hours. No other preference was shown, and no definite trend was evident. The nymphs exhibited a significant preference toward blue only at 72 hours. No trend was observed during the remainder of the testing cycle (Table VII B-4).

Both the apterae and nymphs of the greenbug overwhelmingly preferred green (0.01 level), during each day of the test, over any of the neutral density filters. The neutral density filters were statistically indistinguishable (Table VII C-1). The apterae of the greenbug showed a marked preference for yellow (0.01 and 0.05 level) over any of the neutral density filters which were statistically

indistinguishable. The nymphs also preferred yellow over any of the neutral density filters. In both cases statistical significance was noted during the first 96 hours of the test (Table VII C-2). A definite trend toward red with some significance (0.05 level and 0.01 level) was observed with the apterous greenbugs. The nymphs exhibited this same trend, but to a lesser degree (Table VII C-3). Both the apterae and nymphs of the greenbug showed a statistical preference for blue at 24 hours and 72 hours. No other trends were observed in either case (Table VII C-4).

The apterae and nymphs of the corn leaf aphid clearly demonstrated a preference (0.01 level) for green over any of the neutral density filters (Table VII D-1). Yellow was preferred (0.05 level) over any of the neutral density filters after 24, 72, and 120 hours by the corn leaf aphid apterae. Readings at 48 and 96 hours showed a trend toward yellow, but without significance. The nymphs exhibited a significant preference to yellow over the neutral density filters for the first 48 hours. From 72 to 120 hours a trend toward yellow was indicated, but no significance was shown (Table VII D-2). The corn leaf aphid apterae showed a significant preference for red only at 72 hours. All other readings showed a definite trend toward red, but without significance. The nymphs seemed to prefer the 0.60 neutral density filter with red being a close second, although no statistical significance was shown during the entire 120 hour testing period (Table VII D-3). The corn leaf aphid apterae showed a significant preference for blue only at 72 hours. All other testing periods

showed a trend toward blue even though no significance was shown. Although reproduction was poor, the nymphs did show equally significant preference for blue and the 1.00 neutral density filter, but only at the 96 hour reading. Other testing periods showed a trend toward blue and the 1.00 neutral density filter, but without significance. This test was concluded after 96 hours due to poor survival (Table VII D-4).

CONCLUSIONS

Within the limitations of these studies, color was found to be the primary factor involved in influencing attraction to surfaces with the apterae and nymphs of the English grain aphid, the oat bird-cherry aphid, the greenbug, and the corn leaf aphid.

Color attraction was particularly evident within the green-yellow wavelength range (510m μ -620m μ was the overlapping range of the filters used in these studies). Color attraction was nearly non-existent at the red wavelength range (626m μ -750m μ) and at the blue wavelength range (435m μ -490m μ).

The findings of these studies indicated that light intensity played a secondary role in influencing attraction with these four species of cereal aphids.

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APPENDIX

TABLE I
 Constituents of Artificial Diet

	(mg per 100 ml)
alanine	50.00
arginine	200.00
asparagine	150.00
aspartic acid	50.00
cysteine	25.00
cystine	2.50
gamma amino butyric acid	0.01
glutamic acid	100.00
glutamine	300.00
glycine	10.00
histidine	100.00
isoleucine	100.00
leucine	100.00
lysine-HCl	100.00
methionine	50.00
phenylalanine	50.00
proline	50.00
serine	50.00
threonine	100.00
tryptophane	50.00
tyrosine	10.00
valine	100.00
sucrose	20,000.00
cholesterol	*
ascorbic acid	10.00
biotin	0.20
calcium pantothenate	2.50
choline chloride	20.00
folic acid	0.50
iso-inositol	25.00
nicotinic acid	5.00
para-aminobenzoic acid	5.00
pyridoxine-HCl	1.50
riboflavin	2.50
thiamine-HCl	1.50
B ₁₂	0.20
DL-carnitine	10.00
lipoic acid	2.00
RNA	50.00
salt mix #2	2.50
potassium phosphate (K ₃ PO ₄)	62.00
magnesium chloride (MgCl ₂ 6H ₂ O)	25.00

* cholesterol was added by dissolving the diet in cholesterol-saturated water

Table II A.-Responses of English grain aphids confined under two similarly colored Wratten filters.

Hrs elapsed after start of test	Color of Wratten Filter ^{1/}					Significance ^{3/}
	Red-26 ^{2/}	Green	Red-29 ^{2/}	Blue	Control	
	<u>Survival of Adult Apteræ</u>					
24	17.6 _± 0.8	14.4 _± 1.8	16.2 _± 0.6	17.6 _± 0.8	16.6 _± 0.5	
48	15.4 _± 1.2	12.4 _± 1.3	15.6 _± 0.3	16.4 _± 0.4	15.4 _± 1.1	
72	16.4 _± 0.9	11.2 _± 1.5	14.4 _± 0.5	15.8 _± 0.9	14.8 _± 1.5	
96	15.6 _± 1.0	11.2 _± 1.9	13.6 _± 0.4	14.0 _± 0.7	12.4 _± 1.5	
120	15.0 _± 1.3	11.8 _± 1.8	11.6 _± 0.5	13.4 _± 0.7	11.6 _± 2.0	
144	14.6 _± 0.7a	11.2 _± 1.7a	12.4 _± 0.2a	14.4 _± 0.7a	11.4 _± 2.2a	*
168	13.2 _± 1.0	10.6 _± 1.5	12.0 _± 0.5	12.0 _± 0.5	10.6 _± 2.0	
192	14.6 _± 1.1	10.8 _± 1.6	11.2 _± 0.5	10.0 _± 0.7	10.2 _± 2.3	
216	14.8 _± 1.1a	10.2 _± 1.6b	11.0 _± 0.3b	6.0 _± 1.0c	8.4 _± 1.5bc	**
240	13.0 _± 1.2a	10.2 _± 1.8ab	9.4 _± 0.9b	4.2 _± 0.7c	5.8 _± 0.9c	**

Table II A Continued

Hrs elapsed after start of test	Color of Wratten Filter ^{1/}					Significance ^{3/}
	Red-26 ^{2/}	Green	Red-29 ^{2/}	Blue	Control	
	<u>No. of Nymphs Depcsited</u>					
24	0.2 _± 0.2	0.2 _± 0.2	0.6 _± 0.4	1.6 _± 0.8	1.2 _± 0.4	
48	0.6 _± 0.4	1.0 _± 0.6	1.4 _± 0.9	1.6 _± 0.2	0.4 _± 0.2	
72	0.2 _± 0.2	1.2 _± 0.6	1.6 _± 0.8	1.0 _± 0.3	0.8 _± 0.4	
96	0.4 _± 0.2	1.4 _± 0.6	1.6 _± 0.8	2.4 _± 0.5	2.8 _± 0.4	
120	2.4 _± 0.5	1.6 _± 0.7	3.0 _± 0.7	2.6 _± 0.7	3.2 _± 1.0	
144	2.8 _± 0.6	1.8 _± 0.8	2.8 _± 1.0	2.4 _± 0.8	2.4 _± 0.9	
168	4.8 _± 1.0	2.6 _± 1.2	2.6 _± 1.0	2.8 _± 1.0	3.2 _± 1.1	
192	5.6 _± 1.2	2.8 _± 1.2	2.6 _± 1.3	2.8 _± 0.8	2.8 _± 0.9	
216	6.8 _± 1.2a	3.0 _± 1.3b	2.8 _± 1.6b	1.8 _± 0.8b	1.8 _± 0.9b	*
240	7.8 _± 1.2a	3.4 _± 1.6b	3.0 _± 1.0b	1.2 _± 0.5b	1.6 _± 0.7b	**

^{1/} Means \pm standard deviations are for 5 replicates; 20 aphids per replicate. Means with a, b, or c in common are not significantly different (5%) when compared by Duncan's new multiple range test.

^{2/} Filter numbers refer to those assigned by Eastman Kodak Co. (1965). Spectral transmission of filters 26 and 29 differ as shown in Fig. 1.

^{3/} * F value significant at 5% level; ** at the 1% level.

Table II B.-Responses of oat bird-cherry aphids confined under two similarly colored Wratten filters.

Hrs elapsed after start of test	Color of Wratten Filter ^{1/}					Significance ^{3/}
	Red-26 ^{2/}	Green	Red-29 ^{2/}	Blue	Control	
	<u>Survival of Adult Apteræ</u>					
24	14.8 _± 0.6a	8.4 _± 0.7b	7.8 _± 1.6b	7.4 _± 0.7b	9.4 _± 0.7b	**
48	7.2 _± 1.6a	6.6 _± 1.6a	3.2 _± 0.7b	1.8 _± 0.7b	1.6 _± 0.9b	*
72	8.8 _± 2.1a	4.8 _± 0.9b	1.8 _± 1.0c	1.2 _± 0.4c	0.8 _± 0.2c	**
96	7.2 _± 1.6a	4.6 _± 1.0b	2.2 _± 1.2bc	1.0 _± 0.3c	0.8 _± 0.2c	**
120	5.4 _± 1.3a	4.2 _± 0.9a	1.6 _± 0.9b	0.2 _± 0.2b	0.4 _± 0.3b	**
144	4.6 _± 1.0a	4.2 _± 1.3a	1.0 _± 0.3b	0 b	0.4 _± 0.3b	**
168	3.4 _± 4.8a	2.8 _± 2.7a	0.4 _± 0.3b	0 b	0.4 _± 0.3b	**
192	2.4 _± 1.3a	2.4 _± 2.3a	0 b	0 b	0.4 _± 0.3b	**
216	1.8 _± 1.7a	2.4 _± 2.3a	0 b	0 b	0 b	**
240	1.4 _± 1.3a	1.6 _± 1.3a	0 b	0 b	0 b	**

Table II B Continued

Hrs elapsed after start of test	Color of Wratten Filter ^{1/}					Significance ^{3/}
	Red-26 ^{2/}	Green	Red-29 ^{2/}	Blue	Control	
<u>No. of Nymphs Deposited</u>						
24	0	1.4 _± 0.8	0.4 _± 0.3	0	0	
48	0.2 _± 0.2	1.8 _± 0.9	0.4 _± 0.4	0	0.6 _± 0.4	
72	2.2 _± 1.8	4.4 _± 3.2	0.4 _± 0.4	0.4 _± 0.4	0.2 _± 0.2	
96	1.4 _± 0.8b	7.4 _± 3.1a	0.6 _± 0.9b	0.2 _± 0.2b	0.2 _± 0.2b	* *
120	3.6 _± 2.0b	9.0 _± 3.5a	0.8 _± 0.8b	0 b	0.4 _± 0.4b	*
144	4.4 _± 2.2b	8.8 _± 3.3a	0.4 _± 0.4c	0 c	0.4 _± 0.4c	*
168	3.8 _± 2.0ab	8.6 _± 3.5a	0.4 _± 0.4b	0 b	0.4 _± 0.4b	*
192	3.4 _± 2.0b	8.4 _± 3.3a	0.4 _± 0.4b	0 b	0.6 _± 0.9b	**
216	3.8 _± 2.0b	8.2 _± 3.4a	0.2 _± 0.2b	0 b	0.6 _± 0.9b	**
240	3.8 _± 1.4ab	7.4 _± 2.7a	0 b	0 b	0.4 _± 0.4b	**

^{1/} Means \pm standard deviations are for 5 replicates; 20 aphids per replicate. Means with a, b, or c in common are not significantly different (5%) when compared by Duncan's new multiple range test.

^{2/} Filter numbers refer to those assigned by Eastman Kodak Co. (1965). Spectral transmission of filters 26 and 29 differ as shown in Fig.1.

^{3/} * F value significant at 5% level; ** at the 1% level.

Table II C.-Responses of greenbugs confined under two similarly colored Wratten filters.

Hrs elapsed after start of test	Color of Wratten Filter ^{1/}					Significance ^{3/}
	Red-26 ^{2/}	Green	Red-29 ^{2/}	Blue	Control	
	<u>Survival of Adult Apteræ</u>					
24	17.0 _± 1.4	16.6 _± 0.8	18.6 _± 0.9	14.8 _± 0.6	17.0 _± 1.2	
48	15.4 _± 1.6	14.8 _± 0.9	16.8 _± 0.9	13.4 _± 0.8	12.2 _± 1.0	
72	15.0 _± 1.6	13.0 _± 0.6	14.0 _± 1.1	11.6 _± 0.9	10.2 _± 0.8	
96	14.2 _± 1.6	12.2 _± 1.0	13.2 _± 2.0	11.0 _± 1.3	8.4 _± 0.8	
120	14.0 _± 1.5a	12.0 _± 0.9a	10.8 _± 1.5ab	8.4 _± 0.5bc	7.2 _± 1.0c	**
144	14.0 _± 1.9a	11.6 _± 1.3a	10.8 _± 1.3a	6.8 _± 0.9b	6.8 _± 1.0b	**
168	14.0 _± 1.9a	11.4 _± 1.1a	10.6 _± 1.5a	5.2 _± 0.9b	5.6 _± 1.2b	**
192	13.6 _± 1.9a	10.4 _± 1.0a	10.6 _± 1.1a	4.0 _± 0.8b	5.4 _± 1.3b	**
216	10.0 _± 0.3a	8.4 _± 1.4a	7.4 _± 1.3a	3.4 _± 0.9b	4.0 _± 1.3b	**
240	7.0 _± 0.6a	7.0 _± 0.5a	7.2 _± 2.1a	3.4 _± 0.6b	2.4 _± 1.0b	**

Table II C Continued

Hrs elapsed after start of test	Color of Wratten Filter ^{1/}					Significance ^{3/}
	Red-26 ^{2/}	Green	Red-29 ^{2/}	Blue	Control	
	<u>No. of Nymphs Deposited</u>					
24	5.0 _± 1.5a	5.2 _± 1.7a	1.8 _± 0.9b	0.2 _± 0.2b	0.4 _± 0.4b	**
48	28.6 _± 1.4a	23.0 _± 4.8a	24.6 _± 8.6a	8.2 _± 2.2b	7.2 _± 2.1b	*
72	50.4 _± 4.4a	40.8 _± 6.6a	45.8 _± 13.5a	18.8 _± 3.8b	15.0 _± 3.0b	**
96	78.2 _± 9.1a	60.2 _± 12.0a	67.0 _± 19.0a	27.4 _± 4.1b	24.6 _± 4.1b	**
120	97.6 _± 10.4a	76.0 _± 9.8a	78.2 _± 18.2a	32.0 _± 6.5b	30.2 _± 4.8b	**
144	122.2 _± 11.9a	86.2 _± 9.3a	100.2 _± 21.9a	35.8 _± 7.6b	31.8 _± 3.9b	**
168	134.6 _± 16.0a	94.8 _± 12.5b	95.2 _± 14.1b	35.2 _± 8.5c	35.2 _± 5.5c	**
192	142.8 _± 15.0a	102.2 _± 11.5b	104.0 _± 21.2b	34.4 _± 8.4c	37.6 _± 5.4c	**
216	161.6 _± 13.6a	106.4 _± 15.3b	97.4 _± 16.6b	39.2 _± 9.5c	22.6 _± 4.0c	**
240	117.6 _± 6.9a	109.2 _± 11.4a	104.2 _± 20.0a	37.6 _± 8.8b	22.6 _± 1.7b	**

^{1/} Means \pm standard deviations are for 5 replicates; 20 aphids per replicate. Means with a, b, or c common are not significantly different (5%) when compared by Duncan's new multiple range test.

^{2/} Filter numbers refer to those assigned by Eastman Kodak Co. (1965). Spectral transmission of filters 26 and 29 differ as shown in Fig. 1.

^{3/} * F value significant at 5% level; ** at the 1% level.

Table II D.-Responses of corn leaf aphids confined under two similarly colored Wratten filters.

Hrs elapsed after start of test	Color of Wratten Filter ^{1/}					Significance ^{3/}
	Red-26 ^{2/}	Green	Red-29 ^{2/}	Blue	Control	
	<u>Survival of Adult Apteræ</u>					
24	10.8 _± 2.2	12.6 _± 2.2	14.0 _± 1.7	9.4 _± 1.8	7.6 _± 1.6	
48	8.8 _± 1.9	11.0 _± 2.7	11.0 _± 1.4	7.2 _± 1.7	5.2 _± 0.5	
72	8.2 _± 1.5ab	10.4 _± 1.0a	9.4 _± 1.8ab	5.4 _± 1.1ab	4.2 _± 0.5b	*
96	7.6 _± 1.0ab	9.0 _± 1.0a	8.6 _± 1.9a	5.0 _± 1.2ab	3.2 _± 0.2b	**
120	6.6 _± 1.0ab	8.0 _± 0.8a	7.6 _± 1.8ab	4.0 _± 0.6b	3.0 _± 0.4b	*
144	5.8 _± 0.9a	7.2 _± 0.8a	6.6 _± 1.6a	3.0 _± 1.0b	2.8 _± 2.0b	*
168	3.8 _± 1.1ab	6.0 _± 3.2a	5.4 _± 1.5a	2.2 _± 0.9b	2.2 _± 0.6b	*
192	3.6 _± 0.9ab	5.6 _± 0.4a	5.0 _± 1.5a	1.6 _± 0.8b	1.4 _± 0.5b	**
216	3.6 _± 0.9a	4.6 _± 0.9a	3.6 _± 0.8a	1.2 _± 0.6b	1.0 _± 0.6b	**
240	3.4 _± 0.8a	4.6 _± 0.9a	3.4 _± 0.8a	0.6 _± 0.4b	0.8 _± 0.6b	**

Table II D Continued

Hrs elapsed after start of test	Color of Wratten Filter ^{1/}					Significance ^{3/}
	Red-26 ^{2/}	Green	Red-29 ^{2/}	Blue	Control	
	<u>No. of Nymphs Deposited</u>					
24	1.6 _± 1.0b	7.8 _± 2.5a	1.4 _± 0.8b	0.4 _± 0.4b	0 b	**
48	3.6 _± 0.8b	15.6 _± 5.3a	6.8 _± 1.2b	2.0 _± 1.6b	2.6 _± 0.9b	***
72	6.4 _± 1.8c	26.6 _± 4.5a	11.2 _± 2.8b	3.2 _± 2.8c	5.2 _± 0.9c	***
96	8.0 _± 2.3bc	35.6 _± 7.4a	13.8 _± 3.3b	3.4 _± 2.5c	5.8 _± 1.0bc	***
120	9.0 _± 2.6b	41.8 _± 7.0a	12.8 _± 3.8b	3.2 _± 2.1b	5.0 _± 2.1b	**
144	9.6 _± 2.8b	48.0 _± 7.2a	14.8 _± 3.9b	4.4 _± 2.5b	6.0 _± 0.8b	**
168	10.2 _± 2.9b	47.0 _± 7.5a	13.0 _± 3.3b	2.4 _± 1.0b	4.2 _± 1.5b	**
192	10.6 _± 3.1b	44.8 _± 8.5a	13.0 _± 2.5b	1.6 _± 0.6b	1.8 _± 1.0b	**
216	11.4 _± 3.0b	38.0 _± 3.0a	12.2 _± 3.3b	1.6 _± 1.1b	0.4 _± 0.2b	**
240	12.8 _± 4.2b	32.2 _± 7.5a	9.6 _± 2.5b	1.2 _± 0.8b	0.2 _± 2.0b	**

^{1/} Means \pm standard deviations are for 5 replicates; 20 aphids per replicate. Means with a, b, or c in common are not significantly different (5%) when compared by Duncan's new multiple range test.

^{2/} Filter numbers refer to those assigned by Eastman Kodak Co. (1965). Spectral transmission of filters 26 and 29 differ as shown in Fig. 1.

^{3/} * F value significant at 5% level; ** at the 1% level.

Table III A.-Responses of English grain aphids confined under colored Wratten filters.

Hrs elapsed after start of test	Color of Wratten Filter ^{1/}					Significance ^{2/}
	Yellow	Green	Red	Blue	Control	
	<u>Survival of Adult Apteræ</u>					
48	17.6 _± 1.0a	14.2 _± 1.8ab	15.2 _± 0.9ab	11.4 _± 1.4b	11.4 _± 1.8b	*
72	16.2 _± 1.3	10.2 _± 0.8	12.2 _± 2.1	9.2 _± 1.6	11.0 _± 2.2	
96	13.8 _± 1.1a	8.6 _± 1.6b	8.6 _± 2.4b	6.4 _± 1.9b	8.4 _± 1.1b	*
120	13.0 _± 0.5a	7.6 _± 1.6b	7.0 _± 2.2b	4.4 _± 1.5b	5.6 _± 1.1b	**
144	11.2 _± 0.7a	4.4 _± 1.2bc	5.0 _± 1.7b	1.8 _± 0.7c	5.8 _± 1.5b	**
168	10.8 _± 0.2a	3.8 _± 1.0bc	4.2 _± 1.6bc	1.2 _± 0.6c	4.4 _± 1.2b	**
192	8.6 _± 0.8a	2.4 _± 0.8bc	3.6 _± 1.9b	0.2 _± 0.1c	3.6 _± 1.1b	**
216	6.8 _± 0.7a	1.2 _± 0.4bc	2.6 _± 1.6b	0 c	1.4 _± 0.7b	**
240	5.6 _± 0.7a	0.6 _± 0.7b	2.4 _± 1.8b	0 b	1.4 _± 0.7b	**

Table III A Continued

Hrs elapsed after start of test	Color of Wratten Filter ^{1/}					Significance ^{2/}
	Yellow	Green	Red	Blue	Control	
	<u>No. of Nymphs Deposited</u>					
48	5.4 _± 1.2a	1.4 _± 0.6b	1.8 _± 0.6b	0.8 _± 0.1b	3.0 _± 1.1ab	*
72	9.4 _± 2.6a	1.2 _± 0.1c	4.4 _± 1.6bc	1.4 _± 1.2c	7.0 _± 0.7ab	**
96	14.6 _± 4.4a	1.6 _± 0.6c	2.2 _± 1.3bc	1.4 _± 1.2c	9.8 _± 1.3ab	*
120	18.8 _± 4.9a	3.6 _± 1.4b	4.6 _± 2.2b	0.6 _± 0.4b	7.4 _± 1.1b	**
144	23.4 _± 6.6a	8.4 _± 1.7b	2.8 _± 1.6b	0.6 _± 0.4b	3.0 _± 1.5b	**
168	22.4 _± 4.9a	5.6 _± 1.9b	2.2 _± 1.3b	0.2 _± 0.1b	3.2 _± 1.1b	**
192	23.6 _± 4.4a	3.2 _± 1.2b	1.4 _± 1.0b	0.2 _± 0.1b	3.0 _± 1.3b	**
216	21.6 _± 4.8a	1.6 _± 1.0b	1.4 _± 0.6b	0.2 _± 0.1b	3.8 _± 1.6b	**
240	23.0 _± 4.1a	0.4 _± 0.2b	1.6 _± 1.0b	0.2 _± 0.1b	3.8 _± 1.9b	**

1/ Means \pm standard deviations are for 5 replicates; 20 aphids per replicate. Means with a, b, or c in common are not significantly different (5%) when compared by Duncan's new multiple range test.

2/ * F value significant at 5% level; ** at the 1% level.

Table III B.-Responses of oat bird-cherry aphids confined under colored Wratten filters.

Hrs elapsed after start of test	Color of Wratten Filter ^{1/}					Significance ^{2/}
	Yellow	Green	Red	Blue	Control	
<u>Survival of Adult Apteræ</u>						
48	10.2 _± 1.1	7.2 _± 1.5	6.4 _± 0.8	7.0 _± 1.1	8.4 _± 1.2	
72	3.8 _± 1.0ab	5.2 _± 1.4a	2.4 _± 0.7ab	1.4 _± 0.5b	1.2 _± 0.7b	*
96	1.6 _± 0.6ab	3.2 _± 1.0a	1.2 _± 0.5ab	0 b	0.2 _± 0.1b	**
120	0.8 _± 0.3ab	1.6 _± 0.7a	0.6 _± 0.2b	0 b	0 b	**
144	0.6 _± 0.1	0.6 _± 0.3	0.2 _± 0.2	0	0	
<u>No. of Nymphs Deposited</u>						
48	1.2 _± 1.0	0.8 _± 0.8	0.2 _± 0.1	0	0.8 _± 0.4	
72	1.0 _± 0.5	1.4 _± 1.0	0.6 _± 0.6	0	0.6 _± 0.6	
96	1.8 _± 0.8	1.2 _± 1.0	0.6 _± 0.6	0	0.6 _± 0.9	
120	1.6 _± 0.7	1.2 _± 0.8	0.8 _± 0.8	0	0	
144	1.2 _± 0.2	0.8 _± 0.2	0.2 _± 0.1	0	0	

^{1/} Means _± standard deviations are for 5 replicates; 20 aphids per replicate. Means with a, b, or c in common are not significantly different (5%) when compared by Duncan's new multiple range test.

^{2/} * F value significant at 5% level; ** at the 1% level.

Table III C.-Responses of greenbugs confined under colored Wratten filters.

Hrs elapsed after start of test	Color of Wratten Filter ^{1/}					Significance ^{2/}
	Yellow	Green	Red	Blue	Control	
	<u>Survival of Adult Apteræ</u>					
48	14.2 _± 1.0a	9.0 _± 0.9b	10.8 _± 1.0b	14.0 _± 1.5a	15.0 _± 0.5a	* *
72	14.2 _± 1.1ab	8.8 _± 0.7c	11.6 _± 1.6bc	14.2 _± 1.1ab	16.2 _± 0.7a	**
96	12.8 _± 1.4ab	8.4 _± 1.0bc	9.2 _± 1.9bc	11.6 _± 1.7abc	15.0 _± 1.0a	**
120	12.8 _± 1.1a	6.8 _± 0.9b	8.6 _± 2.2ab	10.4 _± 1.5ab	13.0 _± 1.3a	*
144	12.6 _± 1.1a	6.6 _± 1.1b	8.8 _± 2.0ab	9.0 _± 1.7ab	12.0 _± 1.1a	*
168	12.6 _± 1.2a	6.2 _± 1.5b	7.8 _± 1.8b	6.6 _± 1.5b	10.0 _± 1.2ab	*
192	12.8 _± 0.6a	6.0 _± 1.3b	6.0 _± 1.4b	5.2 _± 1.2b	8.8 _± 1.6b	**
216	10.6 _± 0.1a	5.0 _± 1.1b	4.6 _± 0.7b	4.4 _± 1.1b	6.4 _± 1.3b	**
240	10.4 _± 1.1a	4.4 _± 1.1b	5.0 _± 1.7b	5.2 _± 1.6b	5.4 _± 1.3b	*

Table III C Continued

Hrs elapsed after start of test	Color of Wratten Filter ^{1/}					Significance ^{2/}
	Yellow	Green	Red	Blue	Control	
	<u>No. of Nymphs Deposited</u>					
48	36.6 _± 4.0a	17.6 _± 3.8b	17.2 _± 3.5b	18.8 _± 6.5b	30.0 _± 4.3ab	*
72	50.6 _± 6.1a	23.6 _± 4.5b	25.6 _± 6.5b	28.6 _± 7.2b	41.2 _± 6.7ab	*
96	65.0 _± 7.2a	31.2 _± 6.7b	31.2 _± 10.2b	29.6 _± 8.0b	46.0 _± 6.6ab	*
120	74.0 _± 8.4a	36.0 _± 7.2b	36.0 _± 14.3b	32.0 _± 10.2b	47.4 _± 8.1b	*
144	82.0 _± 10.5a	41.6 _± 7.5b	39.4 _± 14.5b	32.4 _± 11.4b	44.6 _± 6.8b	**
168	88.6 _± 11.2a	45.6 _± 7.1b	39.2 _± 14.2b	31.6 _± 12.8b	48.6 _± 10.6b	**
192	92.4 _± 12.4a	51.0 _± 7.5b	43.0 _± 15.7b	33.0 _± 13.2b	42.6 _± 7.5b	**
216	93.0 _± 10.6a	49.0 _± 7.2b	46.6 _± 16.9b	27.0 _± 13.6b	35.4 _± 8.0b	**
240	97.4 _± 11.5a	52.2 _± 9.0b	47.6 _± 18.3b	28.2 _± 13.0b	31.6 _± 5.7b	**

^{1/} Means \pm standard deviations are for 5 replicates; 20 aphids per replicate. Means with a, b, or c in common are not significantly different (5%) when compared by Duncan's new multiple range test.

^{2/} * F value significant at 5% level; ** at the 1% level.

Table III D.-Responses of corn leaf aphids confined under colored Wratten filters.

Hrs elapsed after start of test	Color of Wratten Filter ^{1/}					Significance ^{2/}
	Yellow	Green	Red	Blue	Control	
	<u>Survival of Adult Apteræ</u>					
48	18.0 _± 0.6	17.6 _± 0.9	15.0 _± 1.0	17.4 _± 0.9	17.2 _± 0.8	
72	15.6 _± 0.3	13.8 _± 0.4	12.4 _± 1.2	15.2 _± 1.5	11.8 _± 1.1	
96	14.0 _± 0.6a	9.2 _± 0.6b	9.9 _± 1.5b	10.4 _± 0.4ab	8.2 _± 2.4b	*
120	12.4 _± 1.2a	8.2 _± 1.0b	6.6 _± 1.1b	6.2 _± 0.7b	5.8 _± 2.1b	*
144	10.8 _± 1.1a	5.8 _± 1.0b	4.4 _± 1.2b	4.0 _± 0.6b	3.2 _± 1.4b	**
168	8.0 _± 1.3a	4.6 _± 0.8ab	7.8 _± 1.7a	3.0 _± 2.3b	1.6 _± 0.7b	*
192	5.8 _± 1.2a	3.0 _± 0.6b	2.4 _± 0.9b	1.2 _± 0.8b	0.6 _± 0.4b	**
216	4.8 _± 1.3a	1.4 _± 0.5b	1.6 _± 1.0b	1.0 _± 0.6b	0.4 _± 0.1b	**
240	2.4 _± 0.7a	1.0 _± 0.7ab	1.2 _± 1.0ab	0.2 _± 0.3b	0.2 _± 0.3b	*

Table III D Continued

Hrs elapsed after start of test	Color of Wratten Filter ^{1/}					Significance ^{2/}
	Yellow	Green	Red	Blue	Control	
	<u>No. of Nymphs Deposited</u>					
48	2.0 _± 0.6	3.2 _± 0.4	6.6 _± 3.1	4.0 _± 1.1	1.2 _± 0.4	
72	3.6 _± 0.2b	8.0 _± 0.9ab	10.6 _± 3.8a	4.4 _± 1.5b	2.4 _± 0.9b	*
96	7.6 _± 1.0	8.8 _± 2.5	13.2 _± 4.9	3.4 _± 0.2	2.2 _± 0.7	
120	12.0 _± 2.6	15.6 _± 3.9	13.4 _± 3.9	5.4 _± 2.1	6.0 _± 3.6	
144	19.4 _± 4.1a	11.6 _± 2.9b	10.2 _± 2.2b	3.8 _± 1.5bc	1.8 _± 0.2c	**
168	21.0 _± 6.0a	10.4 _± 3.3b	3.6 _± 1.0b	1.6 _± 0.8b	1.4 _± 0.5b	**
192	18.0 _± 5.2a	6.6 _± 2.5b	3.8 _± 1.1b	0.6 _± 0.4b	0.6 _± 0.2b	***
216	11.6 _± 3.3a	2.8 _± 2.1b	1.4 _± 0.7b	0 b	0 b	**
240	9.2 _± 3.1a	1.8 _± 1.6b	0 b	0 b	0.2 _± 0.2b	**

^{1/} Means _± standard deviations are for 5 replicates; 20 aphids per replicate. Means with a, b, or c in common are not significantly different (5%) when compared by Duncan's new multiple range test.

^{2/} * F value significant at 5% level; ** at the 1% level.

Table IV A.-Responses of English grain aphids confined under neutral density Wratten filters.

Hrs elapsed after start of test	Standard Neutral Densities ^{1/}				Signif- icance ^{2/}
	3.00	1.00	0.60	0.10	
<u>Survival of Adult Apterac</u>					
24	18.4 _± 0.7	18.8 _± 0.6	19.2 _± 0.1	19.8 _± 0.1	
48	16.8 _± 1.0	18.2 _± 0.7	17.8 _± 0.8	18.2 _± 0.1	
72	16.2 _± 1.2	16.2 _± 1.0	17.4 _± 0.7	18.0 _± 1.3	
96	13.6 _± 1.6	15.2 _± 0.7	16.2 _± 0.6	17.6 _± 0.7	
120	12.6 _± 0.8b	14.6 _± 1.3ab	16.2 _± 0.9a	17.2 _± 0.9a	*
<u>No. of Nymphs Deposited</u>					
48	4.6 _± 1.2	2.0 _± 0.03	2.4 _± 1.2	2.2 _± 0.8	
72	9.6 _± 3.9	2.0 _± 0.8	3.8 _± 1.6	3.4 _± 1.6	
96	12.0 _± 4.4	3.4 _± 0.7	4.8 _± 1.9	5.0 _± 2.2	
120	13.0 _± 4.5	5.4 _± 1.1	7.4 _± 2.3	5.2 _± 0.7	

^{1/} Means _± standard deviations are for 5 replicates; 20 aphids per replicate. Means with a, b, or c in common are not significantly different (5%) when compared by Duncan's new multiple range test.

^{2/} * F value significant at 5% level; ** at the 1% level.

Table IV B.--Responses of oat bird-cherry aphids confined under neutral density Wratten filters.

Hrs elapsed after start of test	Standard Neutral Densities <u>1/</u> <u>2/</u>			
	3.00	1.00	0.60	0.10
	<u>Survival of Adult Apterac</u>			
24	19.2 \pm 0.6	18.6 \pm 0.7	17.4 \pm 1.0	18.8 \pm 0.6
48	11.2 \pm 1.1	12.8 \pm 1.1	10.0 \pm 1.5	12.2 \pm 0.8
72	6.4 \pm 1.0	7.8 \pm 0.6	4.6 \pm 1.2	6.0 \pm 1.0
96	4.8 \pm 0.5	3.2 \pm 0.6	2.0 \pm 0.8	4.2 \pm 1.6
120	2.0 \pm 0.8	2.2 \pm 0.8	1.6 \pm 0.7	3.4 \pm 1.2
	<u>No. of Nymphs Deposited</u>			
48	0.6 \pm 0.04	0.4 \pm 0.02	0.4 \pm 0.02	0
72	0	0.2 \pm 0.01	0.8 \pm 0.02	0
96	0.8 \pm 0.02	0	0.4 \pm 0.01	0.2 \pm 0.01
120	1.0 \pm 0.02	0	0	0

1/ Means \pm standard deviations are for 5 replicates; 20 aphids per replicate. Means with a, b, or c in common are not significantly different (5%) when compared by Duncan's new multiple range test.

2/ These means indicated no significant differences.

Table IV C.-Responses of greenbugs confined under neutral density Wratten filters.

Hrs elapsed after start of test	Standard Neutral Densities ^{1/}				Signif- icance ^{2/}
	3.00	1.00	0.60	0.10	
<u>Survival of Adult Apteræ</u>					
24	16.6±0.4	17.8±0.4	17.2±0.4	16.8±1.5	
48	11.4±1.9	11.8±1.1	9.8±1.2	13.8±1.8	
72	8.8±2.5	5.4±0.5	7.4±1.5	10.8±1.8	
96	6.4±2.1b	3.8±0.7b	7.4±1.8ab	9.4±2.1a	*
120	5.8±1.9b	3.2±0.4c	6.2±1.3b	8.8±1.6a	**
<u>No. of Nymphs Deposited</u>					
48	29.4±7.3	19.2±4.0	31.6±2.6	36.4±7.8	
72	42.8±12.4	26.6±5.5	43.8±10.2	58.6±14.7	
96	47.8±14.4bc	29.4±7.3bc	53.0±11.6ab	72.2±15.6a	**
120	48.2±14.4bc	30.8±7.4c	57.6±12.5ab	87.4±21.2a	**

^{1/} Means ± standard deviations are for 5 replicates; 20 aphids per replicate. Means with a, b, or c in common are not significantly different (5%) when compared by Duncan's new multiple range test.

^{2/} * F value significant at 5% level; ** at the 1% level.

Table IV D.-Responses of corn leaf aphids confined under neutral density Wratten filters.

Hrs elapsed after start of test	Standard Neutral Densities ^{1/}				Signif- icance ^{2/}
	3.00	1.00	0.60	0.10	
<u>Survival of Adult Apteræ</u>					
24	17.8±0.5b	19.2±0.2a	18.6±0.02ab	17.8±0.04b	*
48	15.8±0.8	16.6±0.7	13.2±0.5	15.6±1.2	
72	12.6±0.02	12.8±0.5	11.0±0.8	13.0±1.1	
96	9.0±0.8	10.8±0.8	9.0±1.1	9.6±0.7	
120	7.4±0.5	6.6±1.3	5.8±1.1	7.2±0.9	
<u>No. of Nymphs Deposited</u>					
48	8.6±2.1	10.0±1.8	13.2±3.6	7.8±3.8	
72	15.8±3.6	20.2±5.2	22.8±4.9	10.0±2.6	
96	20.0±5.5	24.0±7.4	27.6±5.5	13.8±3.5	
120	14.4±3.5	13.8±6.2	20.0±4.8	13.2±5.3	

^{1/} Means ± standard deviations are for 5 replicates; 20 aphids per replicate. Means with a, b, or c in common are not significantly different (5%) when compared by Duncan's new multiple range test.

^{2/} * F value significant at 5% level; ** at the 1% level.

Table V A.-Preference of English grain aphids under colored Wratten filters.

Hrs elapsed after start of test	Color of Wratten Filter ^{1/}				Signif- icance ^{2/}
	Yellow	Green	Red	Blue	
<u>Survival of Adult Apteræ</u>					
24	42.0 _± 1.9a	25.2 _± 4.4b	5.0 _± 0.9c	5.0 _± 1.4c	**
48	41.5 _± 7.7a	19.3 _± 4.9b	4.0 _± 0.7b	5.0 _± 2.4b	**
72	39.5 _± 5.0a	6.8 _± 1.8b	5.0 _± 1.5b	3.5 _± 1.6b	**
96	28.5 _± 4.3a	11.0 _± 1.5b	3.5 _± 0.9b	4.3 _± 1.0b	**
120	22.8 _± 8.6a	14.5 _± 4.7ab	3.8 _± 2.3b	2.5 _± 0.9b	
<u>No. of Nymphs Deposited</u>					
24	0	0	0	0	
48	4.0 _± 0.8a	2.8 _± 1.4ab	0.3 _± 0.3b	0.3 _± 0.3b	*
72	8.8 _± 4.7	1.8 _± 0.3	0.5 _± 0.5	0.8 _± 0.3	
96	14.5 _± 4.5	6.0 _± 4.1	0	1.0 _± 0.4	
120	20.5 _± 9.2a	14.3 _± 6.3ab	3.0 _± 1.8bc	0.8 _± 0.5c	*

^{1/} Means \pm standard deviations are for 4 replicates. Means with a, b, or c in common are not significantly different (5%) when compared by Duncan's new multiple range test.

^{2/} * F value significant at 5% level; ** at the 1% level.

Table V B.-Preference of oat bird-cherry aphids under colored Wratten filters.

Hrs elapsed after start of test	Color of Wratten Filter ^{1/}				Signif- icance ^{2/}
	Yellow	Green	Red	Blue	
<u>Survival of Adult Apteræ</u>					
24	23.3 _± 5.2a	30.8 _± 8.9a	2.8 _± 0.2b	7.8 _± 0.9b	**
48	16.3 _± 3.3ab	19.5 _± 5.0a	2.5 _± 0.9c	6.5 _± 3.2bc	*
72	9.5 _± 1.6ab	17.8 _± 6.1a	2.8 _± 0.8b	2.8 _± 0.6b	*
96	6.0 _± 3.0b	15.3 _± 4.6a	2.3 _± 0.2b	2.3 _± 1.5b	*
120	5.0 _± 0.7b	14.3 _± 3.6a	1.0 _± 0.4b	3.3 _± 1.7b	**
<u>No. of Nymphs Deposited</u>					
24	0	0	0	0	
48	5.0 _± 1.2ab	9.5 _± 2.9a	0.8 _± 0.8b	0.3 _± 0.4b	*
72	3.3 _± 0.9b	11.5 _± 2.4a	1.5 _± 0.7b	1.0 _± 0.7b	**
96	5.5 _± 1.6b	14.3 _± 4.8a	1.5 _± 0.5b	2.8 _± 1.3b	**
120	10.0 _± 2.3ab	18.3 _± 5.2a	2.8 _± 1.8b	3.3 _± 0.5b	*

^{1/} Means \pm standard deviations are for 4 replicates. Means with a, b, or c in common are not significantly different (5%) when compared by Duncan's new multiple range test.

^{2/} * F value significant at 5% level; ** at the 1% level.

Table V C.-Preference of greenbugs under colored Wratten filters.

Hrs elapsed after start of test	Color of Wratten Filter ^{1/}				Signif- icance ^{2/}
	Yellow	Green	Red	Blue	
<u>Survival of Adult Apteræ</u>					
24	32.2+4.7a	30.3+2.9a	1.8+0.7b	6.5+1.7b	**
48	26.8+5.7a	9.5+2.9b	2.8+1.6b	3.0+0.7b	**
72	30.5+5.0a	14.3+4.5b	0.5+0.5c	1.3+0.5c	**
96	17.8+3.6a	21.0+2.6a	1.8+0.5b	1.5+0.7b	*
120	23.8+6.3a	15.3+1.8a	1.3+0.9b	1.8+1.0b	**
<u>No. of Nymphs Deposited</u>					
24	0	0	0	0	
48	25.3+10.2a	8.8+2.8ab	0.8+0.5b	0.8+0.8b	*
72	73.3+16.2a	35.5+12.9b	0.4+0.2c	0 c	**
96	110.3+26.3	55.8+8.7	2.3+0.5	3.0+1.5	
120	132.0+35.1a	69.0+4.3b	3.3+2.3c	4.5+4.2c	**

^{1/} Means \pm standard deviations are for 4 replicates. Means with a, b, or c in common are not significantly different (5%) when compared by Duncan's new multiple range test.

^{2/} * F value significant at 5% level; ** at the 5% level.

Table V D.-Preference of corn leaf aphids under colored Wratten filters.

Hrs elapsed after start of test	Color of Wratten Filter ^{1/}				Signif- icance ^{2/}
	Yellow	Green	Red	Blue	
<u>Survival of Adult Apteræ</u>					
24	32.3+5.2a	14.5+1.5b	4.8+1.3c	3.3+0.9c	**
48	21.5+3.6a	12.3+4.4ab	7.5+2.1b	4.8+0.8b	*
72	16.5+3.2a	15.3+2.1a	6.5+1.9b	4.8+0.6b	*
96	18.0+2.6a	8.3+0.5b	6.5+0.7b	4.5+0.3b	**
120	16.8+3.2a	10.5+1.1b	3.8+1.1c	2.8+1.1c	**
<u>No. of Nymphs Deposited</u>					
24	0	0	0	0	
48	17.5+4.1a	16.0+4.9a	3.5+0.7b	2.3+0.2b	*
72	8.8+2.5b	16.8+4.3a	3.8+1.1b	2.8+1.0b	**
96	17.5+5.0a	21.0+3.6a	2.8+1.1b	6.0+1.9b	**
120	10.3+1.9b	21.5+5.3a	4.3+1.4b	6.0+1.8b	**

^{1/} Means + standard deviations are for 4 replicates. Means with a, b, or c in common are not significantly different (5%) when compared by Duncan's new multiple range test.

^{2/} * F value significant at 5% level; ** at the 1% level.

Table VI A.-Preference of English grain aphids under neutral density Wratten filters.

Hrs elapsed after start of test	Intensity of Wratten Filters ^{1/}				Signif- icance ^{2/}
	3.00	1.00	0.60	0.10	
<u>Survival of Adult Apterac</u>					
24	17.8 _± 5.3	8.5 _± 3.4	16.0 _± 7.1	33.8 _± 3.9	
48	12.8 _± 3.9	8.3 _± 2.5	8.0 _± 4.4	17.8 _± 3.8	
72	7.5 _± 1.7b	6.8 _± 1.3b	6.3 _± 2.4b	26.3 _± 2.3a	***
96	5.3 _± 1.9	7.8 _± 3.9	4.5 _± 1.7	18.3 _± 5.1	
120	0	0	0	0	
<u>No. of Nymphs Deposited</u>					
24	6.8 _± 2.7b	2.8 _± 1.2b	5.0 _± 1.7b	17.3 _± 5.3a	*
48	5.3 _± 1.0b	3.3 _± 1.1b	4.8 _± 2.0b	15.0 _± 3.3a	**
72	3.8 _± 1.5b	3.3 _± 0.3b	5.8 _± 1.7b	13.5 _± 4.8a	**
96	1.8 _± 0.5b	4.8 _± 1.8b	2.5 _± 0.7b	12.3 _± 2.7a	**
120	0	0	0	0	

^{1/} Means \pm standard deviations are for 4 replicates. Means with a, b, or c in common are not significantly different (5%) when compared by Duncan's new multiple range test.

^{2/} * F value significant at 5% level; ** at the 1% level.

Table VI B.-Preference of oat bird-cherry aphids under neutral density Wratten filters.

Hrs elapsed after start of test	Intensity of Wratten Filters ^{1/}				Signif- icance ^{2/}
	3.00	1.00	0.60	0.10	
<u>Survival of Adult Apteræ</u>					
24	7.5+1.9b	9.5+3.9b	7.5+2.1b	26.8+5.6a	*
48	0.3+0.3b	8.0+2.7b	4.8+3.0b	48.8+2.6a	**
72	4.3+2.6b	10.0+2.7b	3.3+1.3b	26.8+5.4a	**
96	3.0+1.1b	10.0+3.5b	4.0+2.0b	24.0+6.7a	*
120	4.3+1.9b	12.5+2.1b	3.0+0.6c	18.0+1.7a	**
<u>No. of Nymphs Deposited</u>					
24	1.8+0.6b	1.3+0.8b	1.8+1.0b	7.0+2.6a	*
48	0.3+0.3b	2.5+1.2b	0.8+0.5b	18.5+1.8a	**
72	1.0+0.7b	6.0+2.4b	5.5+3.8b	28.3+2.2a	**
96	0.5+0.5b	9.0+4.7b	6.3+3.2b	38.3+2.3a	**
120	5.8+3.6b	11.8+2.9b	5.0+2.5b	38.5+5.6a	**

^{1/} Means \pm standard deviations are for 4 replicates. Means with a, b, or c in common are not significantly different (5%) when compared by Duncan's new multiple range test.

^{2/} * F value significant at 5% level; ** at the 1% level.

Table VI C.-Preference of greenbugs under neutral density Wratten filters.

Hrs elapsed after start of test	Intensity of Wratten Filters ^{1/}				Signif- icance ^{2/}
	3.00	1.00	0.60	0.10	
<u>Survival of Adult Apteræ</u>					
24	10.5+1.6b	21.5+8.1ab	9.3+1.0b	33.3+5.3a	*
48	11.8+2.7b	16.8+4.7b	10.3+1.1b	35.3+8.5a	*
72	10.5+4.7b	8.8+6.1b	10.8+4.1b	47.3+3.5a	**
96	4.5+1.3b	19.3+7.8ab	9.5+5.2b	39.0+8.4a	*
120	9.0+5.6b	23.5+5.5b	8.0+3.8b	40.8+3.4a	*
<u>No. of Nymphs Deposited</u>					
24	10.8+4.2	21.0+10.1	6.5+3.7	18.3+6.2	
48	21.0+10.8	46.0+14.7	36.5+11.4	104.5+28.7	
72	30.8+13.5b	40.0+21.7b	58.5+22.9b	213.5+38.0a	**
96	26.0+13.9b	125.0+47.3b	77.5+33.8b	248.8+33.4a	**
120	47.5+32.7c	122.3+13.4b	76.5+32.6bc	191.3+13.1a	**

^{1/} Means \pm standard deviations are for 4 replicates. Means with a, b, or c in common are not significantly different (5%) when compared by Duncan's new multiple range test.

^{2/} * F value significant at 5% level; ** at the 1% level.

Table VI D.-Preference of corn leaf aphids under neutral density Wratten filters.

Hrs elapsed after start of test	Intensity of Wratten Filters ^{1/}				Signif- icance ^{2/}
	3.00	1.00	0.60	0.10	
<u>Survival of Adult Apteræ</u>					
24	18.8 _± 1.0b	10.5 _± 3.2c	17.5 _± 2.5b	25.3 _± 3.2a	**
48	15.8 _± 1.2	8.8 _± 1.1	14.8 _± 3.3	16.8 _± 1.2	
72	9.0 _± 1.8	12.0 _± 1.1	11.3 _± 1.1	11.5 _± 2.3	
96	10.8 _± 2.8	7.5 _± 1.3	8.3 _± 0.8	13.5 _± 2.3	
120	6.5 _± 1.0b	5.3 _± 1.6b	8.0 _± 1.6ab	11.0 _± 1.1a	*
<u>No. of Nymphs Deposited</u>					
24	10.8 _± 0.8a	5.0 _± 1.6b	10.5 _± 1.0a	12.0 _± 1.6a	*
48	7.8 _± 1.0b	13.3 _± 6.1b	16.8 _± 5.1b	33.3 _± 1.8a	**
72	16.0 _± 3.4	16.8 _± 4.9	28.3 _± 6.7	38.8 _± 8.5	
96	19.8 _± 5.0	24.0 _± 7.6	27.5 _± 6.0	36.3 _± 3.9	
120	12.8 _± 1.5b	13.0 _± 2.7b	29.3 _± 9.0a	26.0 _± 3.4ab	*

^{1/} Means _± standard deviations are for 4 replicates. Means with a, b, or c in common are not significantly different (5%) when compared by Duncan's new multiple range test.

^{2/} * F value significant at 5% level; ** at the 1% level.

Table VII A-1.-Preferences of English grain aphids under green and neutral density Wratten filters.

Hrs elapsed after start of test	Color or Intensity of Wratten Filters ^{1/}				Signif- icance ^{2/}
	0.60	Green	1.00	3.00	
<u>Survival of Adult Apteræ</u>					
24	3.8+0.5b	43.3+11.0a	2.8+1.5b	3.0+0.7b	**
48	3.0+2.0b	20.8+6.1a	3.8+2.5b	0.5+0.3b	**
72	0 b	18.3+6.7a	0.8+0.3b	1.0+0.4b	**
96	0.8+0.5b	15.3+6.0a	0.5+0.5b	0.3+0.3b	*
120	0.3+0.3	4.8+2.9	1.0+0.4	0	
<u>No. of Nymphs Deposited</u>					
24	0.5+0.3b	5.3+2.3a	0.5+0.5b	0 b	*
48	0 b	4.0+1.2a	0 b	0 b	**
72	0.3+0.3	2.3+1.3	0	0	
96	0	6.0+0.8	0	0	
120	0	0.5+0.3	0	0	

^{1/} Means \pm standard deviations are for 4 replicates. Means with a, b, or c in common are not significantly different (5%) when compared by Duncan's new multiple range test.

^{2/} * F value significant at 5% level; ** at the 1% level.

Table VII A-2.-Preferences of English grain aphids under yellow and neutral density Wratten filters.

Hrs elapsed after start of test	Color or Intensity of Wratten Filters ^{1/}				Signif- icance ^{2/}
	0	Yellow	0.10	3.00	
<u>Survival of Adult Apteræ</u>					
24	4.3+2.1b	49.3+2.5a	6.0+2.9b	2.3+1.8b	**
48	3.5+1.1b	31.3+3.5a	4.8+1.8b	1.8+0.6b	**
72	2.5+1.6b	22.0+4.0a	2.0+1.2b	1.0+0.6b	**
96	2.0+0.9b	19.0+1.2a	1.5+0.3b	1.0+0.4b	**
120	3.5+0.8b	12.0+2.1a	1.8+0.5b	1.0+0.7b	**
<u>No. of Nymphs Deposited</u>					
24	1.8+1.1b	4.0+1.0a	0.5+0.5b	0.3+0.3b	*
48	0.8+0.5b	10.5+2.8a	1.8+0.5b	0.8+0.5b	**
72	0.8+0.3b	8.3+3.2a	0.8+0.3b	0.5+0.4b	*
96	0.8+0.8b	4.8+1.4a	0.5+0.5b	0.3+0.3b	*
120	0.8+0.5b	2.5+0.3a	0.3+0.3b	0 b	**

^{1/} Means + standard deviations are for 4 replicates. Means with a, b, or c in common are not significantly different (5%) when compared by Duncan's new multiple range test.

^{2/} * F value significant at 5% level; ** at the 1% level.

Table VII A-3.-Preferences of English grain aphids under red and neutral density Wratten filters.

Hrs elapsed after start of test	Color or Intensity of Wratten Filters			
	0.60	Red	1.00	3.00
<u>Survival of Adult Apteræ</u>				
24	20.0 _± 5.7	20.3 _± 6.5	6.3 _± 2.1	10.8 _± 3.1
48	10.5 _± 4.0	14.0 _± 5.6	5.0 _± 1.0	5.8 _± 3.0
72	3.0 _± 1.7	10.0 _± 4.0	6.0 _± 1.0	2.0 _± 0.7
96	2.3 _± 1.3	5.3 _± 3.7	1.0 _± 0.4	1.5 _± 1.5
120	1.0 _± 1.0	2.8 _± 1.9	1.0 _± 0.4	0.5 _± 0.5
<u>No. of Nymphs Deposited</u>				
24	1.0 _± 0.4	1.3 _± 0.5	1.0 _± 0.6	0.3 _± 0.3
48	0.8 _± 0.5	0.5 _± 0.3	0	0.5 _± 0.5
72		0.8 _± 0.5	0.3 _± 0.3	0
96		0	0	0
120		0	0	0

1/ Means \pm standard deviations are for 4 replicates; 20 aphids per replicate. Means with a, b, or c in common are not significantly different (5%) when compared by Duncan's new multiple range test.

2/ These means indicated no significant differences.

Table VII A-4.-Preferences of English grain aphids under blue and neutral density Wratten filters.

Hrs elapsed after start of test	Color or Intensity of Wratten Filters <u>1/</u> <u>2/</u>			
	1.00	Blue	3.00	4.00
<u>Survival of Adult Apteræ</u>				
24	15.5+5.2	4.3+1.8	2.5+0.9	8.0+1.5
48	2.8+0.8	2.0+1.0	3.5+0.9	3.8+1.2
72	0.3+0.3	0.5+0.3	1.3+0.6	1.3+0.8
96	0	0	0	0
120	0	0	0	0
<u>No. of Nymphs Deposited</u>				
24	0.8+0.5	0.5+0.5	0	0
48	0	0	0	0
72	0	0	0	0
96	0	0	0	0
120	0	0	0	0

1/ Means + standard deviations are for 4 replicates; 20 aphids per replicate. Means with a, b, or c in common are not significantly different (5%) when compared by Duncan's new multiple range test.

2/ These means indicated no significant differences.

Table VII B-1.-Preferences of oat bird-cherry aphids under green and neutral density Wratten Filters.

Hrs elapsed after start of test	Color or Intensity of Wratten Filters ^{1/}				Signif- icance ^{2/}
	0.60	Green	1.00	3.00	
<u>Survival of Adult Apteræ</u>					
24	1.8+0.9b	19.0+5.5a	6.0+3.4b	0 b	**
48	0.8+0.5b	22.3+5.9a	2.0+0.6b	0.3+0.3b	**
72	0 b	19.3+5.3a	2.3+1.6b	0.3+0.3b	**
96	1.3+0.8b	11.0+2.1a	1.8+0.8b	1.0+0.6b	**
120	0.5+0.3b	8.5+2.0a	0.5+0.5b	0.5+0.5b	**
<u>No. of Nymphs Deposited</u>					
24	0.3+0.3	3.8+2.1	1.3+1.3	0	
48	0 b	18.3+5.8a	1.5+0.9b	0.3+0.3b	**
72	0.5+0.5b	29.3+7.9a	2.3+1.7b	0.8+0.8b	**
96	4.8+2.1b	31.0+7.4a	4.0+2.0b	1.8+1.0b	**
120	10.5+5.6b	28.5+6.9a	3.3+1.4b	3.5+2.8b	**

^{1/} Means \pm standard deviations are for 4 replicates. Means with a, b, or c in common are not significantly different (5%) when compared by Duncan's new multiple range test.

^{2/} * F value significant at 5% level; ** at the 1% level.

Table VII B-2.-Preferences of oat bird-cherry aphids under yellow and neutral density Wratten filters.

Hrs elapsed after start of test	Color or Intensity of Wratten Filters ^{1/}				Signif- icance ^{2/}
	0	Yellow	0.10	0.30	
<u>Survival of Adult Apteræ</u>					
24	7.8+3.8b	33.0+10.2a	4.8+1.9b	1.8+0.9b	*
48	7.3+4.7b	28.5+8.7a	9.3+4.0b	1.5+1.0b	*
72	6.8+2.8b	18.3+3.8a	6.5+2.7b	3.8+1.9b	**
96	7.5+3.0	9.5+2.3	6.8+2.3	4.3+1.3	
120	3.8+1.7	7.5+2.1	4.5+2.4	4.5+2.8	
<u>No. of Nymphs Deposited</u>					
24	1.5+0.3b	23.5+9.9a	2.0+1.1b	0.5+0.5b	*
48	11.3+7.4b	61.3+21.4a	16.0+8.7b	5.5+3.2b	**
72	21.8+10.6b	71.0+26.0a	21.0+10.2b	16.3+9.2b	**
96	36.0+18.3	69.3+26.5	37.8+17.1	20.0+9.9	
120	31.5+15.0	71.0+27.2	47.5+26.4	23.5+11.8	

^{1/} Means + standard deviations are for 4 replicates. Means with a, b, or c in common are not significantly different (5%) when compared by Duncan's new multiple range test.

^{2/} * F value significant at 5% level; ** at the 1% level.

Table VII B-3.-Preferences of oat bird-cherry aphids under red and neutral density Wratten filters.

Hrs elapsed after start of test	Color or Intensity of Wratten Filters ^{1/}				Signif- icance ^{2/}
	0.60	Red	1.00	3.00	
<u>Survival of Adult Apterae</u>					
24	2.3+0.6	16.5+3.8	7.8+6.1	3.3+1.0	
48	0.3+0.3b	21.8+2.8a	2.0+1.4b	1.3+1.3b	**
72	3.3+2.4	9.0+3.1	6.0+3.0	2.0+1.1	
96	3.8+2.3	6.3+2.5	1.8+0.8	4.0+2.5	
120	1.5+1.0	4.0+1.4	1.8+1.4	1.5+1.2	
<u>No. of Nymphs Deposited</u>					
24	0	1.5+1.2	0.3+0.3	0	
48	0	4.0+3.7	0	0.3+0.3	
72	0.8+0.5	6.3+3.7	3.3+2.5	0.3+0.3	
96	4.3+3.3	3.3+1.1	1.0+1.0	4.3+2.7	
120	0.3+0.3	4.8+2.3	3.3+3.0	3.0+2.7	

^{1/} Means + standard deviations are for 4 replicates. Means with a, b, or c in common are not significantly different (5%) when compared by Duncan's new multiple range test.

^{2/} * F value significant at 5% level; ** at the 1% level.

Table VII B-4.-Preferences of oat bird-cherry aphids under blue and neutral density Wratten filters.

Hrs elapsed after start of test	Color or Intensity of Wratten Filters ^{1/}				Signif- icance ^{2/}
	1.00	Blue	3.00	4.00	
<u>Survival of Adult Apterae</u>					
24	10.3 _± 3.6	12.0 _± 4.0	8.8 _± 4.2	23.3 _± 7.2	
48	2.5 _± 1.2b	20.0 _± 2.9a	3.0 _± 0.8b	21.0 _± 6.9a	*
72	6.3 _± 3.0b	21.3 _± 2.9a	7.8 _± 2.8b	6.8 _± 2.1b	*
96	4.3 _± 2.2	11.0 _± 2.3	6.0 _± 2.5	10.3 _± 3.8	
120	3.0 _± 1.2	7.3 _± 3.3	3.0 _± 0.7	5.5 _± 2.7	
<u>No. of Nymphs Deposited</u>					
24	2.3 _± 0.8	1.8 _± 1.4	3.5 _± 1.3	3.8 _± 2.5	
48	1.5 _± 1.0	4.3 _± 1.1	1.3 _± 0.5	5.3 _± 1.7	
72	2.5 _± 1.6b	10.0 _± 2.4a	2.3 _± 1.0b	3.5 _± 0.9b	*
96	2.3 _± 0.9	8.5 _± 2.2	2.3 _± 1.0	8.3 _± 4.3	
120	1.0 _± 0.4	11.5 _± 5.4	1.3 _± 0.8	6.8 _± 3.1	

^{1/} Means \pm standard deviations are for 4 replicates. Means with a, b, or c in common are not significantly different (5%) when compared by Duncan's new multiple range test.

^{2/} * F value significant at 5% level; ** at the 1% level.

Table VII C-1.-Preferences of greenbugs under green and neutral density Wratten filters.

Hrs elapsed after start of test	Color or Intensity of Wratten Filters ^{1/}				Signif- icance ^{2/}
	0.60	Green	1.00	3.00	
<u>Survival of Adult Apteræ</u>					
24	5.0+1.9b	35.0+2.1a	5.3+1.9b	3.5+1.8b	**
48	3.0+0.7b	47.0+9.0a	1.8+0.8b	2.0+0.4b	**
72	3.5+0.6b	39.0+4.5a	8.0+4.2b	5.0+3.7b	**
96	2.5+0.9b	35.8+1.6a	7.8+3.6b	7.8+4.3b	**
120	6.0+0.4b	27.0+2.1a	9.5+1.8b	7.0+2.4b	**
<u>No. of Nymphs Deposited</u>					
24	0 b	70.5+11.4a	3.5+1.3b	0.3+0.3b	**
48	17.0+4.9b	338.0+34.5a	2.3+0.9b	9.8+4.2b	**
72	55.0+20.6b	379.0+14.4a	44.5+20.9b	31.0+25.4b	**
96	60.3+12.4b	375.5+29.4a	95.8+32.8b	77.5+28.9b	**
120	86.8+26.5b	390.8+50.0a	107.0+13.8b	74.0+29.3b	**

^{1/} Means + standard deviations are for 4 replicates. Means with a, b, or c in common are not significantly different (5%) when compared by Duncan's new multiple range test.

^{2/} * F value significant at 5% level; ** at the 1% level.

Table VII C-2.-Preferences of greenbugs under yellow and neutral density Wratten filters.

Hrs elapsed after start of test	Color or Intensity of Wratten Filters ^{1/}				Signif- icance ^{2/}
	0	Yellow	0.10	0.30	
<u>Survival of Adult Apteræ</u>					
24	4.0 _± 1.5b	36.3 _± 4.8a	5.0 _± 0.8b	4.8 _± 2.2b	**
48	2.0 _± 1.7b	26.0 _± 6.3a	3.5 _± 0.5b	1.3 _± 0.9b	**
72	7.5 _± 2.1b	14.8 _± 3.5a	3.5 _± 1.3b	0.8 _± 0.2b	**
96	4.5 _± 2.3b	18.0 _± 5.3a	4.5 _± 1.8b	0 b	*
120	4.0 _± 2.7	8.5 _± 2.1	3.5 _± 0.9	4.5 _± 1.8	
<u>No. of Nymphs Deposited</u>					
24	15.0 _± 6.5b	79.0 _± 13.5a	9.5 _± 3.9b	4.0 _± 1.5b	**
48	29.8 _± 17.9b	185.8 _± 25.2a	29.8 _± 14.0b	7.3 _± 5.5b	**
72	66.3 _± 9.7b	157.5 _± 21.5a	39.5 _± 14.5bc	12.0 _± 4.2c	**
96	59.8 _± 11.0b	123.3 _± 31.3a	65.0 _± 20.4ab	9.0 _± 3.0b	*
120	46.3 _± 15.0	92.0 _± 18.5	45.0 _± 7.3	60.3 _± 21.2	

^{1/} Means \pm standard deviations are for 4 replicates. Means with a, b, or c in common are not significantly different (5%) when compared by Duncan's new multiple range test.

^{2/} * F value significant at 5% level; ** at the 1% level.

Table VII C-3.—Preferences of greenbugs under red and neutral density Wratten filters.

Hrs elapsed after start of test	Color or Intensity of Wratten Filters ^{1/}				Signif- icance ^{2/}
	0.60	Red	1.00	3.00	
<u>Survival of Adult Apteræ</u>					
24	8.0+1.1bc	13.8+1.4a	10.5+1.5ab	4.5+1.3c	**
48	4.5+2.3b	11.8+2.8a	7.5+2.2ab	6.3+2.7b	*
72	7.5+2.5	13.3+5.2	10.5+4.6	8.0+5.5	
96	6.8+3.1ab	10.5+5.3a	17.0+4.3a	0.8+0.5b	*
120	11.5+6.9	12.5+0.9	4.0+1.5	4.8+4.8	
<u>No of Nymphs Deposited</u>					
24	13.5+2.5bc	35.0+6.4a	18.8+5.1bc	3.3+2.6c	**
48	39.8+17.8	96.5+31.9	62.8+19.7	35.5+18.6	
72	73.8+27.7	71.8+20.8	121.8+43.5	47.8+27.3	
96	75.8+14.0ab	118.5+44.2a	141.8+36.0a	18.5+17.2b	**
120	67.8+44.2	122.8+34.2	86.5+40.0	32.8+21.1	

^{1/} Means + standard deviations are for 4 replicates. Means with a, b, or c in common are not significantly different (5%) when compared by Duncan's new multiple range test.

^{2/} * F value significant at 5% level; ** at the 1% level.

Table VII C-4.-Preferences of greenbugs under blue and neutral density Wratten filters.

Hrs elapsed after start of test	Color or Intensity of Wratten Filters ^{1/}				Signif- icance ^{2/}
	1.00	Blue	3.00	4.00	
<u>Survival of Adult Apterac</u>					
24	12.8+2.5b	26.8+2.5a	9.5+1.0b	10.0+1.5b	**
48	18.3+9.6	16.0+4.2	8.3+2.8	8.0+2.3	
72	3.0+1.2b	34.5+10.2a	7.0+4.4b	11.5+1.7b	*
96	11.8+3.4	11.3+2.7	21.8+9.5	6.5+3.9	
120	8.5+1.9	13.5+3.1	4.5+1.9	13.8+8.0	
<u>No. of Nymphs Deposited</u>					
24	9.8+3.4b	33.8+6.3a	3.5+1.9b	6.8+4.5b	**
48	111.8+41.3	90.3+35.8	34.5+13.4	37.8+16.3	
72	40.3+11.4b	249.3+40.6a	75.8+29.3b	92.8+23.5b	**
96	158.5+41.5	99.5+33.2	106.0+36.2	91.8+24.1	
120	120.3+33.7	141.8+51.2	44.8+27.4	174.0+47.0	

^{1/} Means + standard deviations are for 4 replicates. Means with a, b, or c in common are not significantly different (5%) when compared by Duncan's new multiple range test.

^{2/} * F value significant at 5% level; ** at the 1% level.

Table VII D-1.-Preferences of corn leaf aphids under green and neutral density Wratten filters.

Hrs elapsed after start of test	Color or Intensity of Wratten Filters ^{1/}				Signif- icance ^{2/}
	0.60	Green	1.00	3.00	
<u>Survival of Adult Apteræ</u>					
24	9.3 _± 2.5b	47.3 _± 2.1a	12.0 _± 2.5b	11.0 _± 1.9b	**
48	14.0 _± 2.3b	41.0 _± 1.7a	10.8 _± 3.2b	10.3 _± 2.1b	**
72	10.5 _± 1.9b	32.5 _± 3.1a	9.3 _± 1.8b	9.0 _± 0.7b	**
96	7.0 _± 1.7b	32.8 _± 5.1a	7.8 _± 2.3b	9.3 _± 1.7b	**
120	7.8 _± 2.1b	26.8 _± 4.4a	6.8 _± 1.4b	5.0 _± 2.0b	**
<u>No. of Nymphs Deposited</u>					
24	2.8 _± 0.8b	14.8 _± 2.1a	3.5 _± 0.9b	3.0 _± 1.1b	**
48	9.0 _± 1.3b	44.8 _± 6.0a	5.3 _± 0.8b	5.0 _± 0.7b	**
72	7.3 _± 1.0b	33.5 _± 6.3a	6.8 _± 0.9b	6.3 _± 2.2b	**
96	6.5 _± 0.3b	33.5 _± 2.7a	7.5 _± 1.5b	6.3 _± 2.0b	**
120	7.5 _± 1.9b	36.3 _± 5.7a	8.0 _± 2.7b	6.8 _± 2.0b	**

^{1/} Means _± standard deviations are for 4 replicates. Means with a, b, or c in common are not significantly different (5%) when compared by Duncan's new multiple range test.

^{2/} * F value significant at 5% level; ** at the 1% level.

Table VII D-2.-Preferences of corn leaf aphids under yellow and neutral density Wratten filters.

Hrs elapsed after start of test	Color or Intensity of Wratten Filters ^{1/}				Signif- icance ^{2/}
	0	Yellow	0.10	0.30	
<u>Survival of Adult Apteræ</u>					
24	15.0+2.9b	40.3+5.5a	12.8+3.2b	18.3+4.0b	**
48	14.8+2.5	25.0+4.6	13.8+3.1	13.8+2.1	
72	11.5+2.1b	17.3+1.6a	7.0+1.4b	11.0+2.7b	*
96	7.8+2.0	7.3+1.9	3.5+0.5	6.3+1.3	
120	5.0+0.9b	10.5+1.5a	4.5+1.3b	2.8+0.6b	**
<u>No. of Nymphs Deposited</u>					
24	7.8+1.4b	13.5+1.6a	4.8+0.8b	6.0+1.3b	**
48	9.5+1.6b	14.0+3.8a	5.0+1.5b	8.0+1.7b	*
72	9.5+3.7	17.8+4.6	6.3+3.7	5.3+0.9	
96	3.8+0.5	7.3+1.5	5.3+0.3	4.8+0.6	
120	7.3+1.6	15.0+4.5	4.5+0.9	5.0+1.3	

^{1/} Means + standard deviations are for 4 replicates. Means with a, b, or c in common are not significantly different (5%) when compared by Duncan's new multiple range test.

^{2/} * F value significant at 5% level; ** at the 1% level.

Table VII D-3.-Preferences of corn leaf aphids under red and neutral density Wratten filters.

hrs elapsed after start of test	Color or Intensity of Wratten Filters ^{1/}				Signif- icance ^{2/}
	0.60	Red	1.00	3.00	
<u>Survival of Adult Apteræ</u>					
24	9.5+2.9	15.0+1.1	7.3+1.7	9.0+1.6	
48	10.0+3.5	13.8+0.8	12.8+3.7	8.0+1.8	
72	8.5+2.6ab	12.8+0.8a	11.5+1.5ab	3.8+0.8b	*
96	6.8+1.3	8.0+1.1	6.3+2.8	5.5+0.9	
120	2.8+0.5	3.0+0.7	3.0+1.5	2.8+1.2	
<u>No. of Nymphs Deposited</u>					
24	2.0+1.4	1.3+0.5	1.0+0.0	0.3+0.3	
48	3.8+0.9	2.0+0.4	2.8+0.5	0.8+0.3	
72	7.3+2.8	5.8+0.6	6.0+1.2	1.8+0.9	
96	6.5+2.8	2.8+1.1	4.8+1.9	1.5+0.3	
120	2.0+1.0	0.8+0.3	0.5+0.3	0	

^{1/} Means \pm standard deviations are for 4 replicates. Means with a, b, or c in common are not significantly different (5%) when compared by Duncan's new multiple range test.

^{2/} * F value significant at 5% level; ** at the 1% level.

Table VII D-4.-Preferences of corn leaf aphids under blue and neutral density Wratten filters.

Hrs elapsed after start of test	Color or Intensity of Wratten Filters ^{1/}				Signif- icance ^{2/}
	1.00	Blue	3.00	4.00	
<u>Survival of Adult Apteræ</u>					
24	15.5 _± 2.2	16.0 _± 1.8	8.8 _± 0.6	16.3 _± 3.1	
48	7.5 _± 1.2	9.0 _± 2.1	4.0 _± 1.0	6.3 _± 1.9	
72	4.3 _± 1.1b	7.0 _± 1.1a	2.5 _± 0.5b	2.3 _± 0.9b	*
96	2.3 _± 0.5	4.0 _± 0.9	1.5 _± 1.2	1.8 _± 0.8	
120	0	0	0	0	
<u>No. of Nymphs Deposited</u>					
24	3.5 _± 0.6	2.8 _± 0.8	1.3 _± 0.5	1.8 _± 0.9	
48	3.5 _± 2.2	3.5 _± 1.7	0.5 _± 0.3	1.5 _± 0.3	
72	1.3 _± 0.8	2.3 _± 0.9	1.0 _± 0.7	2.0 _± 0.4	
96	1.5 _± 0.6a	1.5 _± 0.6a	0.3 _± 0.3b	0.3 _± 0.3b	*
120	0	0	0	0	

^{1/} Means \pm standard deviations are for 4 replicates. Means with a, b, or c in common are not significantly different (5%) when compared by Duncan's new multiple range test.

^{2/} * F value significant at 5% level; ** at the 1% level.