UNIVERSITY OF MARYLAND EXTENSION | AgFS Agriculture & Food Systems

IPM Threshold Guide for Agronomic Field Crops

ECONOMIC THRESHOLD –
Level of pest activity when control action is suggested to prevent economic injury

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ALFALFA INSECTS

ALFALFA WEEVIL
Begin sampling when feeding damage is noticed
Record # of larvae/**30** stem sample
Determine average plant height in inches (based on $100/ton hay value & $10.00 spray cost/A)
12-18" - **> 60** larvae/ **30** stems.
18-24" - **> 75** larvae/ **30** stems.
> 24" - **> 80** larvae/ **30** stems or **cut.**

POTATO LEAFHOPPER
Sample with 15" sweep net, measure stem height:
< 3"stem ht. – **20** per**100** sweeps or **0.2** per sweep
4-6"stem ht. – **50** per**100** sweeps or **0.5** per sweep
7-10"stem ht. – **100** per**100** sweeps or **1.0** per sweep
10-14"stem ht. – **200** per**100** sweeps or **2.0** per sweep

PEA APHID
50 aphids per sweep or **5-10** per plant

SOYBEAN INSECTS

DEFOLIATION & STAND REDUCTION
Seedlings - **30%** defoliation or **25%** stand Reduction
Vegetative stages - **30%** reduction
Bloom through pod fill - **15%** defoliation
Full green bean to **50%** leaf drop - **35%** defoliation

EARLY SEASON DEFLOIATORS – BEETLES
Defoliation threshold & > **5** larvae per **ft.** of row

LATE SEASON DEFOLIATORS -- WORMS & BEETLES
Defoliation threshold & **5** larvae per **ft**. of row

SPIDER MITES
> **50%** of plants with stippling on **1/3** of leaves and **50** mites per leaflet

THRIPS - drought stressed - **8** per leaflet

POTATO LEAFHOPPER
Drought stressed - **4** per sweep
Non-stressed - **8** per sweep

CORN EARWORM
Drop cloth or Sweep net
Narrow rows - **1** per ft. of row or **3** per **25** sweeps
Wide rows - **2** per ft. of row or **5** per **25** sweeps

CORN INSECTS

CUTWORM
1-2 leaf - **10%** damaged plants
3-4 leaf - **5%** damaged & 4 larvae per 100 plants

WHITE GRUB
Heavy soils - **2** per **sq. ft.**
Sandy soils - **1** per **sq. ft.**

WIREWORM - **1** per bait station

SLUG - spike to 3 leaf - **5** per plant

STALKBORER
4%, **6%** or **10%** damaged at the 2, 3 or 4 leaf stage

ARMYWORM
35% of plants > **50%** defoliated & larvae < **3/4"**

EUROPEAN CORN BORER
Not irrigated - **80%** infested with live larvae
Irrigated - **50%** infested with live larvae

CORN ROOTWORM
1 Western or **2** Northern per plant

SMALL GRAIN INSECTS

CEREAL LEAF BEETLE

Wheat - **1** larvae per flag leaf

Oats - **2** larvae per flag leaf

GRAIN APHID

Tillering **- 150** aphids/row ft. & **< 1** predator/**50** aphids

Heading - **25** aphids/head & <**1** predator/**50** aphids

GRASS SAWFLY

0.4 larvae/ linear row ft. & larvae > ¾ inches

TRUE ARMYWORM

Wheat - **2-3**/linear row ft. & larvae < ¾ inches

Barley - **1**/linear row ft. & larvae < ¾ inches

WEEDS OF FIELD CROPS

ANNUAL WEEDS

per **25 sq. ft**. to cause **10%** loss:

	Drilled	Row
Cocklebur	**1**	**3**
Jimsonweed or Velvetleaf	**1.5**	**3**
Pigweed, Lambsquarters or Morningglory	**3**	**5**
Annual grasses	**5**	**20**

PERENNIAL WEEDS

% of field infested:

Light	**<5%**	Heavy	**<30%**
Moderate	**<10%**	Severe	**>30%**

NOXIOUS WEEDS

No threshold, eliminate all

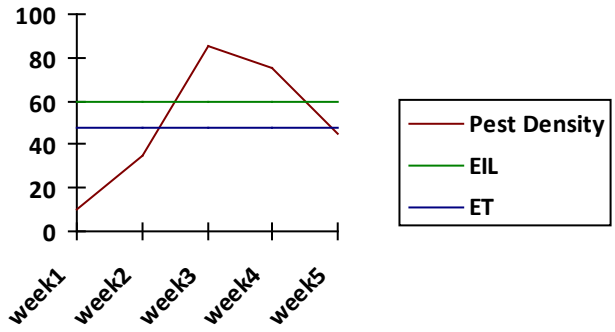
IPM DEFINITIONS

Economic Injury Level - EIL

"The lowest pest population density that will cause economic damage. At the EIL the Cost of Control = Benefit of Control."

Economic Threshold (Action or Treatment Threshold) - ET

"The density of a pest at which control measures should be implemented to prevent an increasing pest population from reaching the EIL -- ET is generally 80% of the EIL."



EIL=Pest Density (P)

$$P = \frac{C}{V \times D}$$

C = Cost of Control
V = Value of Crop
D = Damage

Note: At EIL Benefit = Cost; B=C

Compiled R. D. Myers 2000; Updated 2009: Updated 2017. Compilation and layout assistance by Carol Jelich, Master Gardener, Anne Arundel County.

This reference was adapted from the University of Maryland and Delaware Cooperative Extension Filed Crop and Vegetable IPM Pest Management Manuals.

Reviewed by Galen Dively, Terrance Patton, and Sandra Sardenelli University of Maryland, College Park.

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IPM Threshold Guide
Vegetable Crops

ECONOMIC THRESHOLD –
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COLE CROP INSECTS

Plant Emergence (or Transplanting) to Beginning of Heading or Reproductive Development

CABBAGE ROOT MAGGOT
Control when planting

FLEA BEETLES
> **50%** of newly emerged plants infested and "shothole injury" is present.
Treatment thresholds for leafy cultivars not available

CABBAGE APHIDS AND OTHER APHID SPECIES
Broccoli and Cauliflower - infestations of all species combined reach nearly **100%**
Brussel Sprouts > **15%** of plants are aphid infested from transplanting till **3** weeks before harvest
Cabbage **2%** of plants are infested with **5** or more aphids on leaves

THRIPS
Fresh market cabbage > **20%** of plants infested

IMPORTED CABBAGEWRM, CABBAGE LOOPERS & DIAMONDBACK MOTH CATERPILLARS
Sample 50 plants - treat when count is > **0.5** larval units per plant

Weighting factor for larval unit determination:
Cabbage Looper: large=**1.0** small=**0.7**
Imported Cabbageworm: large=**0.07** small=**0.1**
Diamondback Caterpillar: any size=**0.1**

Heading or Sprout Development

CABBAGE APHIDS AND OTHER APHIDS
Treat when **2%** of plants are infested with > **5** aphids

IMPORTED CABBAGEWRM, CABBAGE LOOPERS & DIAMONDBACK MOTH CATERPILLARS
Cabbage – treat when count is > **0.5** larval units per plant
Broccoli, Cauliflower and Brussel Sprouts – treat when > **1** caterpillar per **25** plants

CUCURBIT INSECTS

Plant Emergence to Three Leaf Stage

SPOTTED AND STRIPED CUCUMBER BEETLES
For wilt susceptible cucumbers and muskmelons – use systemic insecticide treatment at planting time
Provisional threshold for pickling cucumbers – foliar insecticide when **20%** of plants are infested with cucumber beetles

Three Leaf Stage to Harvest Maturity

MELON APHID
Provisional threshold > **20%** of runners have > **5** aphids on leaves

THRIPS
Heavy infestation, leaf injury, plants not actively growing

SPIDER MITES
> **50%** of runners show early leaf injury on crown leaves and live mites present

Three Leaf Stage to Harvest Maturity

SPOTTED AND STRIPED CUCUMBER BEETLES
Thresholds not available
Treat moderate to high CB infestations levels on wilt susceptible varieties
Treat all cucurbits when high CB infestations cause excessive fruit damage

LEAFHOPPERS
Severe leaf injury expected to retard fruit maturity and affect yield

SQUASH VINE BORER
As soon as moths are trapped

LIMA BEAN INSECTS

Bloom to Harvest

PLANT BUGS (LYGUS) –
Early bloom to harvest >**6-10** adult/nymphs per **20** sweeps
After mature bud set >**20-40** adults/nymphs per **20** sweeps

CORN EARWORM
> **50%** of larvae are > **1/2**"

Fordhook Lima Beans:
Up to **4** weeks from harvest > **1** larvae per **6'** of row
Less than **4** weeks from harvest **3** larvae per **6'** of row

Baby Lima Beans:
> **1** larvae per **6'** of row, from late flat pod stage to harvest

PEA INSECTS

PEA APHID - 50 aphids per sweep or **5-10** per plant

PEPPER INSECTS

Early Fruit Set to Harvest

GREEN PEACH APHID

Before fruit formation > **2** aphids per leaf

Once fruit is present **4** aphids per leaf

PEPPER MAGGOT

As soon as flies are caught on sticky traps

EUROPEAN CORN BORER

When fruits are forming on plants > **25** moths trapped per **5** days, average

Shorten treatment schedules if > **100** moths trapped per **5** days

CORN EARWORM

When fruits are forming on plants, >**100** moths trapped per **5** days (see sweet corn section for MDA Pest Survey website link)

POTATO INSECTS

Plant Emergence to 12" Shoots

POTATO FLEA BEETLE

>**20%** leaf loss

COLORADO POTATO BEETLE

Overwintered >**5** adults per **10** plant clusters and > **10%** shoots chewed off at ground level

All stages

Chemical treatments:

Defoliation **20%** and density per **10** plant clusters > **5** adults or > **40** small larvae or **15** large larvae or combination of any **2** stages, at **1/2** above levels

Bt treatment:

10% plant infestation, > **30%** eggs hatched (trigger date)

Greater Than 12" Shoots to Bloom

GREEN PEACH APHID, POTATO APHID

Prior to bloom - **2** per leaf

During bloom - **4** per leaf

Within 2 weeks of vine kill - **10** per leaf

Greater Than 12" Shoots to Bloom

MELON APHID -

Prior to bloom >**1** per leaf

During bloom > **2** per leaf

Within 2 weeks of vine kill > **5** per leaf

POTATO LEAFHOPPER

> **3** adults per sweep or > **1** nymph per **10** leaves

EUROPEAN CORN BORER

100 moths trapped per **5** days (reduce if host plants unavailable) or **5%** of leaves are infested with egg masses

Bloom to 50% Leaf Yellowing or Vine Kill

COLORADO POTATO BEETLE

Defoliation > **30%** and potential for further damage

SNAP BEAN INSECTS

Plant Emergence to 3rd Trifoliate Stage

SEEDCORN MAGGOT

5 to **10** maggots per seed

THRIPS

> 6 per leaflet with leaf injury

SPIDER MITES

> **20** live mites per leaflet

BEAN LEAF BEETLE AND MEXICAN BEAN BEETLE

Pre trifoliate stage **6** or more per **row foot**

Post-trifoliate stage **20%** leaf loss, > **2** per plant

Prebloom Stage (3rd Trifoliate to Bud)

POTATO LEAF HOPPER

> **5** adults+nymphs per sweep

MEXICAN BEAN BEETLE

> **20%** defoliation

BEAN APHID

50% or more have **5** or more aphids per terminal, distributed throughout

GREEN CLOVERWORM

>**20%** defoliation and >**15** larvae < **1**"per sweep

Bloom to Harvest

LEAFHOPPERS

During podset >**25** per adults/nymphs per sweep

During bloom >**12** adults/nymphs per sweep

MEXICAN BEAN BEETLE

Defoliation > **10%** during podding and population present

EUROPEAN CORN BORER

>**25** moths trapped per **5** days

CORN EARWORM

> **100** moths per **5** days

SWEET CORN INSECTS

CUTWORM

1-2 leaf - **10%** damaged plants

3-4 leaf - **5%** damaged & 4 larvae per 100 plants

WHITE GRUB

Heavy soils - **2** per **sq. ft.**

Sandy soils - **1** per **sq. ft.**

WIREWORM

1 per bait station

SLUG

Spike to 3 leaf - **5** per plant

STALKBORER
4%, **6%** or **10%** damaged at the 2, 3 or 4leaf stage
ARMYWORM
35% of plants > **50%** defoliated & larvae < **3/4"**
EUROPEAN CORN BORER
Not irrigated - **80%** infested with live larvae
Irrigated - **50%** infested with live larvae
CORN ROOTWORM
1 Western or **2** Northern per plant
FLEA BEETLE
For Stewart's wilt susceptible varieties from spike stage to silking >5% of plants infested
CORN EARWORM
At tassel emergence >15% tassel infestation
From tasseling to harvest -1st spray at 30% silk and apply subsequent sprays according to 5-day trap catch

TOMATO INSECTS

Plant Emergence or Transplant to 10" Plants
COLORADO POTATO BEETLE
Overwintered CPB:
At plant emergence - adults reducing plant densities below recommended levels for maximum yield
Actively growing > **15** adults per **10** plants
10" Plants to Early Fruit Set
COLORADO POTATO BEETLE
All stages
Chemical Treatments:
Defoliation **20%** throughout and > **20** adults and/or larvae per **10** plants
Bt Treatment:
10% plant infestation with egg masses and > **30%** eggs hatched (trigger date)
10" Plants to Early Fruit Set
POTATO APHID, GREEN PEACH APHID
Natural controls not present and > **20%** of terminals are infested
SPIDER MITES
No specific threshold - treat during hot dry weather when damage is noticed due to heavy infestations
HORNWORMS
20 % defoliation and further damage potential
Early Fruit Set to Fruit Maturity or Vine Kill
COLORADO POTATO BEETLE
Defoliation potential > **10%** or > **2%** of plants have at least **1** freshly-injured fruit
TOMATO PINWORM
Active leaf mines > **0.7** per trifoliate leaf
TOMATO FRUITWORM
> **5** damaged fruit in sample of **200** (**2.5%** damage)

WEEDS OF FIELD CROPS

ANNUAL WEEDS
 # per 25 sq. ft. to cause 10% loss:
Cocklebur ---------- **3**
Jimsonweed or Velvetleaf ---------- **3**
Pigweed, Lambsquarters
or Morningglory ---------- **5**
Annual grasses ---------- **20**
PERENNIAL WEEDS
% of field infested:

Light	<**5%**	Heavy	<**30%**
Moderate	<**10%**	Severe	>**30%**

NOXIOUS WEEDS -- no threshold, eliminate all

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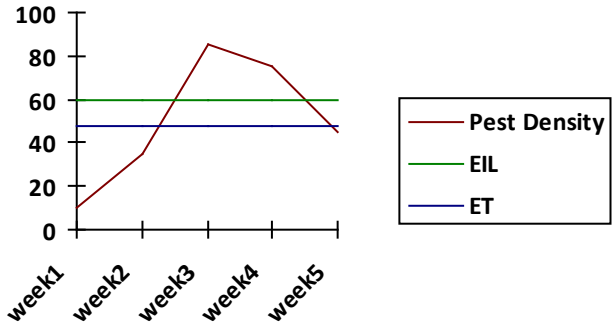

EIL = Pest Density (P)
P = C
V X D
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V = Value of Crop
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