

Progress Report of IR-4 Blueberry Research

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According to the USDA statistics (2015) Michigan was ranked #1 in the harvested acres (19,400) and #4 in the utilized production (73.1 M lbs) of cultivated blueberries in the United States. MBG Marketing, represented by Dave Trinka, in close association with MSU scientists and the IR-4 Project introduced pest management tools for blueberry growers. Since 1997 through IR-4, 19 products (3 fungicides, 9 herbicides, 1 PGR and 6 insecticides/miticides) are labeled for pest control. However, many more products will be available soon. The GLP residue trials were conducted by MSU scientists of John Wise and Tony VanWoerkom at Department of Entomology, and Bernie Zandstra, at Department of Horticulture. Also, Scott Chapman and Dan Heider, University of Wisconsin, contributed to the blueberry GLP projects. The efficacy/crop safety data were provided by Annemiek Schilder at Department of Plant, Soil and Microbial Sciences for diseases, John Wise and Tony VanWoerkom at Department of Entomology for insects and Bernie Zandstra, at Department of Horticulture for weeds.

One IR-4 PPWS (pest problem without solutions) project in 2017 is a biopesticide project to control blueberry stem gall wasps that are spreading in Michigan, because no conventional insecticides appear to work. Some cultivars are highly susceptible, accounting for over 30% of Michigan acreage. Growers need a bee-safe approach to protect blueberry shoots from stem gall wasp. Rufus Isaacs, at Department of Entomology, MSU is heading the project.

IR-4 Project Labeled Products for Blueberry

Diseases

Pesticide	Reasons for Need	Product	Use Pattern**
2003*			
FLUAZINAM (FRAC C5)	ANTHRACNOSE, MUMMYBERRY	Omega 500F fungicide(Syngenta)	Apply 7- to 10-day interval, Use adequate water to provide coverage of foliage, flowers and fruit. DO NOT use more than 7.5 pints per acre per growing season. DO NOT use an adjuvant in the spray mixture with Omega 500F on this crop. DO NOT apply within 30 days of harvest (30-day PHI). REI = 12 hours.
2006			
METCONAZOLE (FRAC G1)	ANTHRACNOSE, MUMMY BERRY	METCONAZOLE 50WDG fungicide (VALENT)	(FOR BUSHBERRY SUBGROUP 13-07B) MAKE FOLIAR APPLIC OF 0.078 LB AI/A OF METCONAZOLE 50 WDG FUNGICIDE BY GROUND (MINIMUM 20 GPA) OR AIR (MINIMUM 10 GPA) WHEN CONDITIONS FAVOR DISEASE DEVELOPMENT AND PRIOR TO INFECTION; MAKE NO MORE THAN 3 APPLIC/SEASON AND USE IN ALTERNATE APPLIC WITH A NON-GROUP 3 FUNGICIDE; APPLY NO MORE THAN 0.234 LB AI/A/SEASON; 7-DAY PHI
2009			
FENPYRAZAMINE (FRAC G3)	MONILINIA, BOTRYTIS	V-10135 4SC fungicide (VALENT)	FOR BUSHBERRY SUBGROUP 13-07B: USE V-10135 4 SC FUNGICIDE AT 0.375- 0.5 LB AI/A IN A MINIMUM GPA OF 20 BY GROUND, 5 BY AIR; APPLY AS A FOLIAR SPRAY STARTING PRIOR TO INFECTION AND CONTINUING ON A 7-14 DAY INTERVAL; MAKE NO MORE THAN 2 SEQUENTIAL APPLIC, NOR MORE THAN 3 APPLIC PER SEASON; MAX 1.5 LB AI/A/SEASON; 0-DAY PHI

* year project initiated

**Use pattern for reference only; please consult label for additional information

Weeds and PGR

Pesticide	Reasons for Need	Product	Use Pattern**
1997*			
GLUFOSINATE (HRAC H/WSSA 10)	ANNUAL & PERENNIAL WEEDS, BRAMBLES	Rely 280 herbicide (BAYER)	POSTEMERGENCE DIRECTED; 1.5 LB.AI/A; 2 APPLIC; 28 DAY INTERVAL; 28 DAY INTERVAL; 14 DAY PHI
1999			
CLOPYRALID (HRAC O/WSSA 4)	WEEDS	Stinger herbicide (DOWAGR)	FOR BUSHBERRY SUBGROUP 13-07 B, APPLY 0.25 LB AI/A OF STINGER HERBICIDE, IN A MINIMUM 20 GPA BY GROUND, DIRECTED TO THE SOIL FROM THE PLANTS TO THE ROW MIDDLE, WITHOUT CONTACTING FOLIAGE OR WOODY PORTIONS; A SECOND APPLIC CAN BE MADE A MINIMUM 14 DAYS LATER; 30-DAY PHI
2003			
FLUMIOXAZIN (HRAC E/WSSA 14)	WEEDS	Chateau WDG herbicide (Valent)	0.25-0.75 LB.AI/A; DIRECTED SPRAY 2 SPLIT RATE
2004			
CLETHODIM (HRAC A/WSSA 1)	ANNUAL, PERENNIAL GRASSES	PRISM herbicide (Valent)	APPLY 9-16 FL OZ (ANNUAL GRASS RATE) OR 12-16 FL OZ/A (PERENNIAL GRASS RATE) OF V-10137 1 EC HERBICIDE, WITH 0.25% V/V NON IONIC SURFACTANT; MINIMUM RETREATMENT INTERVAL IS 14 DAYS; APPLY POSTEMERGENCE TO ACTIVELY GROWING GRASSES; USE A MINIMUM 5 GPA FOR GROUND APPLIC, AND MINIMUM 3 GPA FOR AERIAL APPLIC; MAXIMUM 64 FL OZ/A (0.5 LB AI) PER SEASON; 14-DAY PHI
FORCHLORFENURON	ENHANCING FRUIT SIZE & SET	CPPU-KT30 plant growth regulator (VALBIO)	8-15 GRAMS OF PRODUCT IN 250 GAL WATER/A; AIR BLAST OR BLOOM SPRAYER; ONE APPLIC 3 WEEKS AFTER PETAL FALL; 30-DAY PHI; ONE APPLIC/SEASON
2005			
SULFENTRAZONE (HRAC E/WSSA 14)	WEEDS, NUTSEDGE	Zeus XC herbicide (FMC)	0.25 -0.375 LB AI/A SINGLE APPL. MAX 0.375 LB AI/A/YEAR
2006			
HALOSULFURON (HRAC B/WSSA 2)	WEEDS, NUTSEDGE	Sandea herbicide (GOWAN)	2.0 OZ/A; DIRECTED OVER THE TOP OF RECENTLY PLANTED CROP; 50 GPA; MORE THAN 1 YEAR PHI

2008			
RIMSULFURON (HRAC B/WSSA 2)	QUACKGRASS, WEEDS	Matrix herbicide (DUPONT)	ON Highbush blueberry, make a single broadcast applic of 4 oz/a of Matrix SG formulation preemergence or early postemergence directed at actively growing weeds; or apply as a banded treatment up to twice per year, but do not exceed 4 oz/a/season on a broadcast applic basis; minimum 30-day spray interval; minimize spray contact with blueberry plants and use on plants that have gone through at least one growing season; do not use on soils classified as sand; 21-day PHI
SETHOXYDIM (HRAC K1/WSSA 1)	GRASS WEEDS	Poast herbicide (BASF)	USE POAST HERBICIDE (1.5 LB AI/GAL): FOR Highbush blueberry apply 2.5 pt/a in minimum 10 gpa, with crop oil concentrate (2 pt/a) or methylated/modified seed oil (1.5 pt/a); allow 14 days before retreatment, max 2 applic totaling 5.0 pt/a per season; apply broadcast to ground on each side of the row; 1-day PHI; for lowbush blueberry and other low-growing berries, follow the same use pattern except apply broadcast over the top of plants and observe a 30-day PHI
2011			
PENDIMETHALIN (HRAC K1/WSSA 3)	ANNUAL WEEDS	Prowl H2O herbicide (BASF)	FOR USE IN BEARING AND NON-BEARING bushberries, use Prowl H2O herbicide (3.8 LB AI/GAL): apply only by ground, 2.0-6.3 qt (2-6 LB AI)/a, depending on weed control program, infestation level, etc.; apply in single applic or sequentially at minimum 30-day interval; max 6.3 qt/a per year; 30-day PHI

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Insects/Mites

Pesticide	Reasons for Need	Product	Use Pattern**
2003*			
INDOXACARB (IRAC 22A)	FRUITWORM	Avaunt insecticide (DUPONT)	(FOR BUSHBERRY SUBGROUP) MAKE UP TO 4 APPLIC OF 0.065-0.11 LB AI/A AT A MINIMUM 7-DAY SPRAY INTERVAL; FOR BEST RESULTS APPLY IN 20-50 GPA BY GROUND OR MINIMUM 10 GPA BY AIR; 7-DAY PHI.
METHOXYFENOZIDE (IRAC 18)	FRUITWORM, LEAFROLLER	Intrepid 2F insecticide (DOWAGR)	0.25 LB.AI/A; FOLIAR; 3 APPLIC; 7 DAY PHI
2004			
BIFENTHRIN (IRAC 3A)	MITES, CRANBERRY FRUITWORMS, LEAFROLLERS, BLUEBERRY MAGGOT	Brigade WSB insecticide (FMC)	0.05 LB.AI/A; FOLIAR; 5-50 GPA; 4 APPLIC AT 7 DAY INTERVAL; PRE-BLOOM, POST-BLOOM; 0.2 LB.AI/A/YEAR; 3 DAY PHI
2005			
NOVALURON (IRAC 15)	GALL MIDGE, THRIPS, CRANBERRY & CHERRY FRUITWORMS	Rimon 0.83EC insecticide (ADAMA)	20-30 FL.OZ OF RIMON 0.83 EC INSECTICIDE/A; APPLY AT EGG HATCH TO EARLY INSTAR LARVAE OR PRIOR TO EGG DEPOSITION, DEPENDING ON TARGET SPECIES; SPRAY INTERVAL 10-14 DAYS; MAXIMUM 3 APPLIC PER CROP PER SEASON, AND MAXIMUM 90 FL. OZ./A/SEASON; 8-DAY PHI.
2007			
CHLORANTRANILIPR OLE (IRAC 28)	CRANBERRY FRUITWORM, CHERRY FRUITWORM	DPX-E2Y45 35WG insecticide (DUPONT)	0.044 LB AI/A (2 OZ/A FORMULATED); 2 APPLIC/SEASON; FOLIAR SPRAY IN 30-70 GALLONS/A WATER; 3-DAY PHI
2011			
FLUPYRADIFURONE (IRAC 4D)	BLUEBERRY MAGGOT, APHIDS	Sivanto 200SL insecticide (BAYER)	20-80 G AI/A (9.4-13.7 OZ PRODUCT/A); FOLIAR SPRAY; 2-3 APPLIC; 7-DAY RE-TREATMENT INTERVAL; 3-DAY PHI; AIRBLAST SPRAY 20-60 GPA

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IR-4 Studies Submitted / To be Submitted for Blueberry Diseases

Pesticide	Reasons for Need	Product	Use Pattern**
2012*			
PENTHIOPYRAD (FRAC 7)	MUMMY BERRY, PHOMOPSIS, ALTERNARIA FRUIT ROT, ANTHRACNOSE FRUIT ROT	Fontelis fungicide (DUPONT)	24 FL OZ/A; 3-4 FOLIAR APPLIC; 14-DAY RE-TREATMENT INTERVAL; APPLY FROM GREEN TIP ONWARDS DURING PERIODS OF DISEASE PRESSURE; 7-DAY PHI/ FINAL REPORT SIGNED; READY FOR SUBMISSION

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Weeds and PGR

Pesticide	Reasons for Need	Product	Use Pattern**
2004*			
S-METOLACHLOR (HRAC K3/WSSA 15)	NUTSEDGE	Dual Magnum herbicide (SYNGEN)	0.67-1.33 PT/A OF DUAL MAGNUM HERBICIDE (0.64-1.27 LB AI/A) IN A MINIMUM 20 GPA; LOWBUSH BLUEBERRY: MAKE A SINGLE POST EMERGENCE BROADCAST APPLIC PRIOR TO WEED EMERGENCE; Highbush BLUEBERRY AND OTHER BUSHBERRIES: MAKE A SINGLE BANDED APPLIC TO THE SOIL SURFACE ON BOTH SIDES OF THE PLANT ROW (3-FOOT BAND ON EACH SIDE) PRIOR TO WEED EMERGENCE, AVOIDING CONTACT WITH CROP FOLIAGE; MAXIMUM ONE APPLIC AND 1.27 LB AI/A PER CROP PER SEASON; 28- DAY PHI / TOLERANCE ESTABLISHED; REGISTRANT CAN CONSIDER 24C LABELS IF STATES SUBMIT REQUESTS:02/11
2010			
FLUAZIFOP-P-BUTYL (HRAC AWSSA 1)	GRASSES	Fusilade DX herbicide (SYNGEN)	USE FUSILADE DX HERBICIDE (AN EC WITH 2 LB ISOMER [FLUAZIFOP-P- BUTYL]/GAL): BY GROUND APPLY 0.375 LB AI/A IN 2 BANDED APPLIC TO THE BASE OF PLANTS OUT TO 3 FT ON EACH SIDE OF PLANTS, IN 5-40 GPA, 14-DAY

			INTERVAL; FOR LOWBUSH BLUEBERRY APPLY THE SAME RATE IN 2 FOLIAR BROADCAST APPLIC AT 14-DAY INTERVAL; ALWAYS ADD A CROP OIL CONCENTRATE OR NONIONIC SURFACTANT; 1-DAY PHI/ NOTICE OF FILING ISSUED/PROPOSAL
QUINCLORAC (HRAC O/WSSA 4)	FIELD BINDWEED, HEDGE BINDWEED, BARNYARDGRASS, CANADA THISTLE, LARGE CRABGRASS	Quinstar 4L herbicide (ALBAUGH)	0.175-3.75 LB AI/A; FOLIAR APPLIC; 1-2 APPLIC; 2-9 MONTH RE-TREATMENT INTERVAL; 30-DAY PHI/ NOTICE OF FILING ISSUED/PROPOSAL
2013			
INDAZIFLAM (HRAC L/WSSA 29)	ANNUAL & PERENNIAL WEEDS	Alion herbicide (BAYER)	USE INDAZIFLAM 500SC OR 200SC (ALION) HERBICIDE: MAKE GROUND APPLIC OF 0.045-0.065 LB AI/A, BASED ON % SOIL ORGANIC MATTER, IN MINIMUM 10 GPA, AND NO MORE THAN 2 APPLIC PER YEAR (ONE PER YEAR IN CA); IN CA, DO NOT APPLY UNTIL AT LEAST 3 YEARS AFTER BUSHES WERE PLANTED; APPLY AS A DORMANT APPLIC IN LATE FALL THROUGH EARLY SPRING BEFORE BUD SWELL; MINIMUM RETREATMENT INTERVAL IS 90 DAYS; 14-DAY PHI/ NOTICE OF FILING ISSUED/PROPOSAL
2014			
ISOXABEN (HRAC L/WSSA 21)	BROADLEAF WEEDS	Trellis SC herbicide (DOWAGR)	0.75-1.0 LB AI/A; SOIL APPLIC; UP TO 1.0 LB AI/A APPLIC; 60-DAY RE-TREATMENT INTERVAL; 7-DAY PHI; POST DIRECTED TO ESTABLISHED PLANTS/ NOTICE OF FILING ISSUED/PROPOSAL

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Insects/Mites

Pesticide	Reasons for Need	Product	Use Pattern**
2009*			
SPIROTETRAMAT (IRAC 23)	APHIDS, SCALE INSECTS	Movento Insecticide (BAYER)	0.1 LB AI/A (6-8 FL OZ); FOLIAR OR SOIL APPLIC; 2 APPLIC; 30 DAY RE-TREATMENT INTERVAL; 7-DAY PHI; SOIL APPLIC MUST BE FOLLOWED WITH

			IRRIGATION OR RAIN; 15 GPA MIN OF GROUND APPLIC/ TOLERANCE ESTABLISHED
2010			
TOLFENPYRAD (IRAC 21A)	CRANBERRY FRUITWORM, PLUM CURCULIO, BLUEBERRY MAGGOT	Hachi-Hachi SC insecticide (NAI)	17-21 OZ/A; AIR-ASSISTED GROUND SPRAYER AND AERIAL APPLIC, FOLIAR SPRAY; 2-3 APPLIC; 14-DAY RE-TREATMENT INTERVAL; 3-DAY PHI/ FINAL REPORT SIGNED; READY FOR SUBMISSION
2014			
SULFOXAFLOLOR (IRAC 4C)	CONTROL OF APHIDS, LEAFHOPPERS, PLANT BUGS, MEALYBUGS, SUPPRESSION OF THRIPS AND SCALES	Closer SC insecticide (DOWAGR)	MAKE 4 FOLIAR APPLIC BY GROUND OR AIR OF 0.045-0.09 LB AI/A; AT 7-DAY INTERVALS; 7-DAY PHI/ ALL DATA RECEIVED AT HQ

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Active IR-4 Blueberry Projects

Diseases

Pesticide	Reasons for Need	Product	Use Pattern**
2016*			
POTASSIUM PHOSPHITE (FRAC 33)	NEED TO ESTABLISH A TOLERANCE TO SUPPORT EXPORT MARKETS, ESPECIALLY THE EU:03/16	Funji-Phite fungicide (VLSCI)	AT 7-DAY INTERVALS AND 3-DAY PHI; ALL APPLIC SHALL INCLUDE AN ADJUVANT AT A LABELED RATE / COMPLETE WITH ON-GOING TRIALS
PYDIFLUMETOFEN (FTH 545) (FRAC 7)	ALTERNARIA FRUIT ROT, MUMMY BERRY, BOTRYTIS BLOSSOM BLIGHT AND FRUIT ROT	FTH545 200 SC fungicide (SYNGEN)	SUGGESTED USE PATTERN: 2 APPLIC OF 150 G AI/HA, FOLIAR APPLIC, 7-DAY INTERVAL, 0-DAY PHI; USE AN ADJUVANT AT RECOMMENDED RATE IF NEEDED; SHOULD MATCH STRAWBERRY USE PATTERN (/ COMPLETE WITH ON-GOING TRIALS

Insects/Mites

Pesticide	Reasons for Need	Product	Use Pattern**
2015*			
FENPYROXIMATE (IRAC 21A)	TWO SPOTTED SPIDER MITE, BLUEBERRY BUD MITE, WHITEFLIES	Fujimite XLO insecticide (NAI)	2 FOLIAR APPLIC WITH GROUND SPRAYER AT 14-DAY INTERVAL; 1-DAY PHI/ COMPLETE WITH ON-GOING TRIALS
2016			
ACEQUINOCYL) (IRAC 20B)	TWO-SPOTTED SPIDER MITES, BROAD MITES; SOUTHERN RED MITE ADDED BY FL REQUEST	Kanemite 15 SC insecticide (ARYSTA)	MAKE TWO FOLIAR APPLIC OF 0.3 LB AI/A IN MINIMUM 30 GPA, 14-DAY INTERVAL, 1-DAY PHI (COVERS FL REQUEST FOR A 7-DAY PHI) / COMPLETE WITH ON-GOING TRIALS

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2017 Blueberry Projects

Food-use

2017			
BUPROFEZIN (IRAC 16)	SCALE INSECTS (WITH INCREASED USE OF PYRETHROIDS FOR SWD, SECONDARY PESTS LIKE SCALES HAVE INCREASED)	Centaur 70 WDG insecticide (NAI)	USE THE PRODUCT; MAKE 1 FOLIAR APPLIC OF 34.5 OZ PRODUCT/A; 7-DAY PHI (SPRAY TIMING IS BEST WHEN CRAWLER STAGE OF SCALES IS TARGETED)
FLONICAMID (IRAC 16)	APHIDS, PLANT BUGS, THRIPS (APHIDS IN NJ TRANSMIT DISEASE, AND ALTERNATIVES TO NEONICOTENOIDS ARE NEEDED)	Beleaf 50SG insecticide (ISK)	MAKE 2-3 FOLIAR APPLIC OF 100-150 G AI/HA (2.8-4.3 OZ/A), 7-DAY INTERVAL; 0-DAY PHI

Biopesticide

Title	Principal Investigator
Efficacy of an Attract and Kill SPAT formulation for management of Spotted Wing Drosophila (SWD) in blueberry and caneberries	John Wise, Michigan State University
Efficacy of Biopesticides on Blueberry for the Control of Stem Gall Wasp (<i>Hemadas nubilipennis</i>)	Rufus Isaacs, Michigan State University
Mitigation of residues of export concern in blueberry through the utilization of biopesticides for end of season management of Spotted Wing Drosophila (SWD).	Rufus Isaacs, Michigan State University