INTEGRATED PEST MANAGEMENT OF GRAPE - EUCLID IPM PACKAGES

	DISEASES	MANAGEMENT CRITERIA	NOVEL SOLUTIONS FROM EUCLID PARTNERS (YEAR OF EXPECTED AVAILABILITY)	LIST OF ACTIVE INGREDIENTS	ALLOWED IN ORGANIC FARMING	Max nb. of a. i. application/year (see note 1)	Max nb. of a.i. group application/year (see note 2)	RESTRICTIONS OF USE AND NOTES
PLANT PATHOGENS	**Downy mildew** *(Plasmopara viticola)*	**General indications:** Use a preventive control approach. Adoption of DSS tools is highly recommended. The following aspects should be considered: weather forecast, supposed epidemic risk and possible residual control of previous treatments. The duration of efficacy of treatments is related to the persistence of the products applied, to their resistance to watering and to vine growth speed. When the bunch of grapes start to be closed, the disease is usually less dangerous so it is possible to apply copper fungicides only.	2017-2019: Integration of products present in the list of active ingredients with products from project partner ANT: at least "ANT-Ca" x 2 applications applied every 7-14 days prior to flowering (during bud break) and 2 applications during fruit set and fruit fill. Contact **ANT**: ceo@agrinewtech.com for more details 2018-2019: To optimize pesticides use apply the DOSA3D Decision Support System. Contact project partner **University of Lleida**: santiago.planas@udl.cat for more details	Benalaxyl			3	
				Benalaxil-M				
				Metalaxyl		1		
				Metalaxyl-M				
				Amisulbrom		3	3	
				(Cyazofamid + Disodium phosphonate)				
				Ametoctradin		3		
				Benthiavalicarb-isopropyl			4	After the 3rd consecutive treatment with CAA use an a.i. with a different mode of action.
				Dimethomorph				
				Iprovalicarb				
				Mandipropamid				
				Valifenalate				
				Cymoxanil		3		
				Zoxamide		4		
				Fosetyl-Al				
				Famoxadone		1	3	
				Fenamidone				
				Pyraclostrobin				Exclusively usable in a mixture with other fungicides for
				Potassium phosphonate		5		
				Fluopicolide		2		
				Metiram				Dithiocarbamates and Ditianon are usable up to fruit set and in any case not later than 30 June.
				Propineb				
				Dithianon		3	4	
				Mancozeb		3		
				Folpet		3		
				Fluazinam		3		
				Copper fungicides	YES			Maximum 6 kg/ha of a.i./ha/year.
	Powdery mildew *(Uncinula necator-Oidium tukeri)*	**High-risk areas:** Start the treatments from bud burst (presence of infected sprouts) or in the stage of separation bunches. Since the beginning of flowering until the closure of bunch the control must be carried out with great attention, alternating as much as possible available products. **Low-risk areas:** the specific treatments may be started just before the beginning of flowering and finished at bunch closure. **Notes:** *Ampelomyces quisqualis* , potassium bicarbonate and sulphur are primary recommended for the control.	2017-2019: Integration of products present in the list of active ingredients with products from project partner ANT: at least "ANT-Ca" x 2 applications applied every 7-14 days prior to flowering (during bud break) and 2 applications during fruit set and fruit fill. Contact **ANT:** ceo@agrinewtech.com for more details 2018-2019: To optimize pesticides use apply the DOSA3D Decision Support System. Contact project partner **University of Lleida**: santiago.planas@udl.cat for more details	*Ampelomyces quisqualis*	YES			
				Azoxystrobin				
				Pyraclostrobin				
				Trifloxystrobin			3	
				Potassium bicarbonate	YES			
				Boscalid			1	
				Cyflufenamid		2		
				Meptyldinocap		2		
				Bupirimate		3		
				Metraphenone		3		
				Spiroxamine		3		
				Quinoxyfen		2		
				Cyproconazole				
				Difenoconazole				
				Myclobutanil		1		
				Propiconazole			3	
				Tebuconazole				
				Fenbuconazole				
				Penconazole				
				Tetraconazole				
				Sulphur	YES			
	Grey mould (*Botrytis cinerea*)	**Agronomic strategies**: - to select vine varieties and rearing systems; - to adopt balanced fertilisations; - to carry out green pruning in a rational way. **Chemical strategies**: In vine varieties located in the high-risk areas are recommended 2 preventive measures: in bunches pre-closing stage and 3-4 week before the harvesting. Do not carry out more than 2 treatments per year against grey mould except for the biological products:*A. pullulans, B. amyloliquefaciens, B. subtilis* and Potassium bicarbonate. **Low-risk areas**: it is recommended to treat only if the weather condition is very much in favour to disease development.	2017-2019: Application of the BCA MACH1 from project partner ANT: at fuit set, fruit ripening and before harvesting. Contact **ANT**: ceo@agrinewtech.com for more details	*Aureobasidium pullulans*	YES			
				Bacillus amyloliquefaciens	YES			
				Bacillus subtilis	YES			
				Potassium bicarbonate	YES			
				Fludioxonil		1	1	Only 1 treatment between Pirimetanil, Ciprodinil and Ciprodinil+Fludioxonil.
				Cyprodinil		1		
				Pyrimethanil		1		
				Boscalid			1	
				Fenhexamid		1		
				Fenpyrazamine		1		
				Fluazinam			3	

Black rot *(Guignardia bidwelli)*	**Agronomic strategies:** - collecting and destroying infected bunches; - burning pruning parts. **Chemical measures:** Treating only in the vine varieties affected by this desease.	No specific strategies developed within EUCLID project	Difenoconazole		**1**	**3**	
			Myclobutanil				
			Penconazole				
			Tetraconazole				
			Trifloxystrobin			**3**	
			Mancozeb			**3**	**Usable only up to fruit set and in any case not later than 30**
Dead-arm *(Phomopsis viticola)*	It is recommended to carry out treatments at the first vegetative phases, only in the vine varieties affected by this disease.	No specific strategies developed within EUCLID project	Mancozeb			**3**	**Usable only up to fruit set and in any case not later than 30 June.**
			Metiram				
			Propineb				
			Sulphur	YES			
Esca and other wood fungal diseases *(Phaeomoniella chlamydospora, Phaeoacremonium aleophilum, Fomitiporia mediterranea)*		No specific strategies developed within EUCLID project	*(Trichoderma asperellum + Trichoderma gamsii)*	YES			
Grapevine trunk diseases *(Eutypa lata* and *Botryosphaeria dothidea)*		2018-2019: Trichoderma strains. Contact **BINAB** for more details: thomas.ricard@binab.se					

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(2) Limitation of active ingredients (a.i.) application must be considered as total limit number of applications of a.i. from the same group (same chemical families generally)/year for each pest. The a.i. indicated in the same merged cells are from the same group and can be therefore used for the same target. If the column is empty, no restrictions shoud be considered.

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INSECT PESTS	**European grapevine moth** *(Lobesia botrana)* **Vine moth** *(Eupoecilia ambiguella)* **Eulia** *(Argyrotaenia (=Eulia) pulchellana)*	**General indications:** Treatments with insecticides against the first generation are forbidden. Thresholds for II and III generations: 5% of bunches infested by eggs in case of application with Bacillus thuringiensis; 10% of bunches infested by eggs in case of application of other insecticides. Maximum 2 treatments/year with synthetic products. Time of sampling: II generation: from "inflorescence development" to "closure of the bunch"; III generation: from "ripening/veraison" to 1st decade of September. The use of the *B.thuringiensis* requires the best timing (black head or half hatching eggs) and accuracy of implementation. It is recommended to add 500 g/hl of sugar to *B. thuringiensis* . The treatment must be to repeat in case of rain because the product is easily washed out.	No specific strategies developed within EUCLID project	*Bacillus thuringiensis var. kurstaki*	YES			
				Sexual confusion and disorientation method	YES			**Sexual confusion and disorienation methods are primary tools to be used against the moths.**
				Indoxacarb			1	
				Spinosad	YES	1	2	
				Chlorantraniliprole		1		
				Methoxyfenozide				**Authorised only against Lobesia**
				Tebufenozide				
				Emamectin		2		**Authorised only against *Lobesia botrana* and *Eupoecilia ambiguella*.**
	Smaller green leafhopper *(Empoasca vitis)*	**General indications:** Maximum 1 treatmentsw/year, to be done on the II generation. Thresholds for treatments: - susceptible vine variety: > 1.5 mobile forms/ leaf; - moderate susceptible variety: > 2.5 mobile forms/ leaf; - tolerant variety: > 4 mobile forms / leaf; - for other cultivars: > 2,5 mobile forms / leaf.	No specific strategies developed within EUCLID project	Insecticidal soaps (Potassium Salts of Fatty Acids)	YES			
				Buprofezin			1	
				Etofenprox			1	
				Indoxacarb			1	
				Thiamethoxam			1	**Only for post-flowering treatments.**
	American grapevine leafhopper *(Scaphoideus titanus)*	**General indications:** Carry out the treatments in the outbreak and risk areas, according to indications from local authorities. Maximum 3 treatments, except for field of mother plants for scions. Treatments with pesticides are forbidden for not damaging bees during flowering of grape or natural flowering of spontaneous plants.	No specific strategies developed within EUCLID project	Buprofezin			1	
				Chlorpyrifos			1	**Treatments to be carried out not later than June 30th.**
				Chlorpyrifos-methyl			1	
				Etofenprox			1	
				Acetamiprid			1	**Only for post-flowering treatments.**
				Thiamethoxam				
	Auger beetle and vine borer *(Sinoxylon sexdentatum) (Sinoxylon perforans)*	**General indications:** Apply agronomic strategies in case of heavy attacks: hang up along the rows from mid-April to mid-May, groups of vine sticks from pruning to attract the ov deponent females. In the middle of June, when the oviposition is over, remove and burn the sticks to destroy eggs and larvae present	No specific strategies developed within EUCLID project					
	Yellow spider mite *(Eotetranychus carpini)* **European red spider mite** *(Panonychus ulmi)*	**General indications:** Maximum 1 acaricide treatment/year. Threshold considering the presence of natural predators (Phytoseiidae, Miridae, Anthocoridae, Coccinellidae...): - visibly separated bunches: 5 mobile forms/ leaf; - mid-July : 10 mobile forms/ leaf; - mid-August: 10 mobile forms/ leaf.	2018-2019: Multi-outlet sprayers with outlets (MakatoSEP MB &llemo Hardy Mercury) are more adapted to early stages. Adjust the volume rates by canopy vigour characterization from aerial images to reduce the amount of pesticides. Good efficacy of abamectine against yellow spider mite at a lower dose with low vigour of plants. For indications on the application of DSS-DOSA3d, contact project partner **University of Lleida**: santiago.planas@udl.cat	Tebufenpyrad Clofentezine Hexythiazox Pyridaben Etoxazole Abamectin (aka avermectin)				
NEMATODES	**Grape Nematodes** *(Xiphinema index)*	**General indications:** Use healthy and certified breeding material from nurseries.	No specific strategies developed within EUCLID project					
OCCASIONAL INSECT PESTS	**Grape Thrips** *(Drepanothrips reuteri)*	Evalulate the situation at the beggining of season and apply treatments only in case of heavy infestations that stop budding.	No specific strategies developed within EUCLID project	Spinosad	YES		2	
	Noctuids	Maximum 1 treatment/year localised at the base of the stump, only after establishing the initial damages during the budding phase. Hand-picking is recommended for small surfaces (<0.5 ha)	No specific strategies developed within EUCLID project	Deltamethrin Beta-cyfluthrin				
	Grape leaf rust mite *(Calepitrimerus vitis)*	Maximum 1 treatment/year, in case of heavy infestations at bud break.	No specific strategies developed within EUCLID project	Hexythiazox Mineral oil Abamectin (aka avermectin) Etoxazole	YES			

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