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1200 Pennsylvania Ave. NW
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RE: Pesticide Registration Review: Proposed Interim Decisions for Several Pesticides, Iprodione
EPA Docket ID: EPA-HQ-OPP-2012-0392

To Whom it May Concern,

The following comments are submitted regarding the Proposed Interim Decision of the active ingredient iprodione. These comments are being submitted on behalf of the Western IPM Center to provide input on the use of iprodione in multiple commodities important in Oregon and Washington. Iprodione has important uses across a broad sector of Pacific Northwest crops. Industries which rely on iprodione include clover for seed, cruciferous seed crops, blueberry, caneberries, winegrapes, succulent beans, turf and ornamentals. Our goal is to summarize usage of iprodione in the Pacific Northwest, and provide stakeholder feedback on how the changes in the Proposed Interim Decision may affect their respective industries.

Please see responses below organized by each proposed mitigation.

1.a Proposed application prohibitions – residential turf

Of the listed prohibition sites, athletic fields for the professional and college level are most likely to be affected. Turf in athletic fields is kept shorter, which leads to higher disease pressure from pink and grey snow molds. In central and eastern Oregon, athletic fields would likely be treated once per year before snowfall; whereas the Willamette Valley and coastal regions of Oregon would be expected to apply twice over 9 to 12 months of disease pressure. On athletic fields with disease damage, the fields could still be playable, and managers are likely to re-seed the damaged areas. Costs to these managers would be in the form of new sod or new seed, but be relatively low. We can support this mitigation.

1.b Proposed prohibition on golf courses except tees and greens

We can support this mitigation if it is necessary to lower risk to acceptable levels.

1.c Proposed reduction of maximum application rate and number of applications on tees and greens

According to industry experts, the lowest rate that is trialed and recommended for grey and pink snow mold control in turf is slightly higher than the proposed maximum application rate, at 2.72 lbs a.i./A, or 4 fl oz/1000ft^2. However, the efficacy is greater at 6 fl oz/1000ft^2 (4.08 lbs a.i./A)[1]. The 6 fl oz/1000ft^2 rate is especially important for applications in central and eastern Oregon because the application must be put on just prior to snowfall and remain effective under the snow.

Annual applications for control of gray and pink snow molds are approximately 2 per year in Central and Eastern Oregon and Washington, 10 per year in the Willamette Valley where disease pressure is high for 9 months of the year, and 12 applications per year on the Oregon coast, where disease pressure is high all year long[2,3]. There is known resistance to several of the alternative chemistries, including thiophanate-methyl and azoxystrobin. Reducing the number of allowable iprodione applications to one per season will increase the selection pressure on these and other alternative active ingredients in western regions of Oregon and Washington, where monthly applications for disease control are required. Additionally, there are seven combination products in Oregon that contain iprodione; limitation of iprodione also affects use of these products.

Poor control of snow molds on golf greens and tees may result in playing surfaces which are uneven and unplayable. The potential economic losses to golf courses is estimated at over $500,000 per golf course per year. These costs include the lost revenue from an estimated two month closure to repair the greens, purchase of new sod, and labor for install. The Golf Course Superintendents Association of America estimates that there are 720 golf courses in the Pacific Northwest.

We ask that EPA please consider one or more of the following suggested changes:

- An increase in the maximum use rate to 8 fl oz/1000ft^2, up from 3.8 fl oz/1000ft^2 as proposed.
- Allowing two applications per year in western and coastal Oregon and Washington, where disease pressure remains high over the majority of the year. Two applications will reduce resistance development to alternative active ingredients.
- Allowing one application per year at 8 fl oz/1000ft^2 in central and eastern Oregon and Washington, where applications are timed immediately before snowfall. Because of the snow, maintenance of tees and greens is not conducted, which will limit occupational post-application risks for this use. Label language with differing use patterns for snow cover vs no snow cover are already available to the industry (e.g. Turfcide 400, EPA reg. no. 5481-8992).

2.a Proposed cancellation of uses

Of the listed crops proposed for cancellation, highbush blueberry, caneberry and succulent beans are all grown extensively in the Pacific Northwest, and cancellation of these iprodione uses will have significant negative impacts on disease control and resistance management in all three industries.

Blueberry and caneberry. The Pacific Northwest is a national leader in berry production. Blueberry production in both Oregon and Washington topped 31,000 acres and yielded 322 million pounds in 2020. Raspberries are grown on over 10,000 acres across Oregon and Washington, with a yield over of 70 million pounds. Blackberries are grown primarily in Oregon, with a reported 6,300 acres in production in 2017.

Iprodione is a critical component of control programs for *Botrytis cinerea* in Pacific Northwest blueberry and caneberry production. *B. cinerea* is the causal agent for botrytis blight. Control of the disease requires four to six applications of fungicides, throughout the bloom and fruit development period up until harvest[4,5]. In high disease pressure years, up to eight applications may be required to minimize fruit losses. Historically, iprodione was widely used for *Botrytis* control, until widespread resistance limited its utility for disease management. However, the reduction in usage from the 1990's to the early 2010's resulted in a drop in the prevalence of highly insensitive iprodione isolates[6,7].

Blueberry and caneberry growers have a variety of fungicides from different FRAC groups available to use, though nearly all of these active ingredients are plagued by the presence of resistant isolates. Screenings of 106 isolates from blueberry in Washington in 2012[8] and of 584 isolates from blueberry, raspberry, blackberry and strawberry in Oregon in 2014-2018[6,9] reveal the extent of the problem. Both surveys showed widespread resistance to boscalid (FRAC 7): 47% of isolates in Washington and 60% of isolates in Oregon. Resistance is also present in cyprodinil (FRAC 9; 29% and 35% of WA and OR isolates), fenhexamid (FRAC 17; 29% and 30% of WA and OR isolates), and pyraclostrobin (FRAC 11; 47% of WA isolates). Cross-resistant strains are also present in Oregon, with 18% of strains tolerant to two FRAC groups and 23% tolerant to 3 or more FRAC groups. Conversely, the presence of insensitive iprodione isolates in Oregon was documented at only 4%[9].

Recognizing that the botrytis resistance issues were jeopardizing the Pacific Northwest small fruit industries, a disease management task force was created in the early 2010s, comprised of crop consultants, USDA and university scientists, crop commissions and growers[10]. Among the recommendations that the task force made was to re-introduce iprodione into the fungicide rotation for *Botrytis* management. Currently, blueberry and caneberry growers apply only one application per year of iprodione, and iprodione is viewed as a critical rotational tool.

Table 8 of the Proposed Interim Decision lists occupational post-application cancer risk estimates associated with various cultural practices conducted in blueberry, raspberry and blackberry. Of the listed activities, frost control, moving handset irrigation, and hand-weeding are practices that are not standard in Pacific Northwest production; while hand pruning, transplanting, and training are practices that are done early in the growing season, prior to beginning a *Botrytis* control program. The operations most likely to occur within 30 days after treatment with iprodione are field scouting and, for some operations, hand harvesting.

Options for *Botrytis* management in Pacific Northwest blueberries and caneberries are extremely limited. Loss of iprodione will increase use of and jeopardize the longevity of FRAC12 and non-boscalid FRAC7 fungicides. The industries request allowing labeled use of one application of iprodione per year for blueberry and caneberry production.

Succulent beans. Iprodione is used for management of Sclerotinia white mold (causal agent: *Sclerotinia sclerotiorum*) in succulent beans. Infection with white mold can lead to rejection of entire lots of beans at processing facilities, leading to significant economic losses to producers. The most efficacious spray programs are a two-spray program with a tank mix of iprodione and thiophanate-methyl at top of the label rates. Growers will typically make applications at 10% bloom – often in April or May – and a second application 5-7 days later[11]. In high disease pressure years, a third application may be required for adequate control.

Alternatives for white mold control do not have similar levels of efficacy to top of the label rates of iprodione + thiophanate-methyl. One-spray programs provided less control than two-spray programs, with one-spray programs leading to greater pod infection rates, especially under high disease pressure[12]. Some of the alternatives include boscalid (Endura, EPA reg. no. 7969-197), fludioxonil + cyprodinil (Switch 62.5WG, EPA reg. no. 100-953), and fluazinam (Omega 500F, EPA reg. no. 71512-1-100); however, multiple efficacy trials conducted at Oregon State University show inferior disease control with these materials relative to the iprodione + thiophanate-methyl standard[13,14,15).]

Current Oregon State University recommendations for both resistance management and good disease control are a tank-mix or consecutive applications of thiophanate-methyl and iprodione at top labeled rates; or application of boscalid or fludioxonil + cyprodinil following an application of iprodione + thiophanate methyl tank mix[11]. The most likely outcome for cancellation of iprodione for succulent bean producers will be application of thiophanate-methyl without a tank partner, resulting in increased resistance development to this active ingredient. Additionally, higher disease pressure is likely to result from increased levels of inoculum in the soil.

Table 8 of the Proposed Interim Decision lists occupational post-application cancer risk estimates associated with various cultural practices conducted in succulent beans. Hand-harvesting is not conducted in conventional production in the Pacific Northwest; instead, fields are machine harvested and transported to the processor. At the time that iprodione is applied to bean plants (during bloom), scouting is conducted from the margins of the field because the dense plant growth prevents walking through the field without damaging the crop. A minority of fields do still rely on hand-set irrigation, and this field activity may be conducted following iprodione applications, though most operations relying on hand-set irrigation would not move the hand-line part way though the growing season.

Efficacious options for Sclerotinia white mold control in the Pacific Northwest are limited. Industry experts are concerned about the use of thiophanate-methyl without iprodione as a tank partner, and the risk of resistance development resulting from this use. A restriction on movement of handline irrigation post-application in order to reduce occupational post-application risks would not impact the majority of the succulent bean industry. The industry requests allowing continued labeled use of one application of iprodione per year for control of white mold.

2.b Proposed restriction of number of applications

Industries with concerns about the restriction on the number of applications are clover for seed and brassica/cruciferous crops grown for seed.

Brassica/cruciferous crops grown for seed. The Willamette Valley and Skagit Valley are some of the only regions in the world where brassica seed can be produced. These regions produce crucifer seed for markets worldwide. As a seed treatment, iprodione is critical for control of black leg disease and as a foliar treatment, iprodione is an important tool for Sclerotinia soft rot and stem rot management.

Two special local needs labels in the Pacific Northwest, OR-140013 and WA-160007, currently allow iprodione for use as a seed treatment on crucifer and brassicaceous crops grown for seed. The seed treatment is for control of black leg disease, light leaf spot, and white leaf spot; though of these, black leg is the most economically impactful pathogen[16]. If a grower plants black leg-infected seed, the plants are subject to dramatic effects, including stunting. It can take only 2-3% infected seed to lead to an epidemic. There is zero tolerance for black leg on the harvested seed, and if it is detected, a grower will be unable to market their entire seed yield for that field. Industry experts estimate that 100% of conventionally grown crucifer seed crops are planted using iprodione as a seed treatment each year.

A foliar application of iprodione is also applied to cruciferous seed crops for control of Sclerotinia watery soft rot and stem rot (causal agent: *Sclerotinia sclerotiorum*). Oregon growers have a special local needs label, OR-130001, which allows up to three applications of iprodione, typically applied during full bloom for *Sclerotinia* control. Alternatives include penthiopyrad (Fontelis, EPA reg. no. 352-834; Endura, EPA reg. no. 7969-197), fludioxonil + cyprodinil (Switch 62.5WG, EPA reg. no. 100-953), and polyoxin-D (OSO 5%SC, EPA reg. no. 68173-4-70051). Root crop brassica seed (turnip, radish and rutabaga) are absent from the polyoxin-D label. While efficacy work conducted in crucifer seed crops is not available, the pathogen *S. sclerotiorum* is the same species causing white mold in succulent beans, and lower efficacy of these alternative products is likely[13,14,15].

Table 8 of the Proposed Interim Decision lists occupational post-application cancer risk estimates associated with various cultural practices conducted in *Brassica* crops, though these are not applicable to *Brassica* seed production. In general, there are no human activities in a brassica seed field until after pollination has been completed. The activities listed in Table 8 include scouting, hand harvesting, hand weeding, and tying, topping or training; none of these activities are standard following iprodione application in brassica seed production.

The Proposed Interim Decision is unclear on whether the restriction to one application of iprodione per year is only for foliar applications, or if the seed treatment use would be included. The Oregon seed industry, which has a SLN for both the seed use and the foliar use, requests that both of these uses – 1 seed treatment and up to 2 foliar applications – per year continue to be allowed to protect the industry against black leg and provide an effective management tool for Sclerotinia watery soft rot and stem rot.

Clover grown for seed. Oregon's Willamette Valley is a premier clover seed production region for both domestic and international markets, with 39,000 acres harvested and a farm gate value of $35 million in 2020[17]. Iprodione is utilized in clover seed production for control of Sclerotinia crown rot and wilt. In western Oregon, iprodione is a critical tool for Sclerotinia crown rot and wilt (causal agent, *Sclerotinia trifoliorum*) management in red, white and crimson clover for seed. Crimson clover is typically most severely affected by the disease, but red and white clover species are affected as well. The disease causes wilt and dieback of new clover growth in the spring[18]. In red and white clover, only two FRAC groups are available for management: iprodione (FRAC2) and azoxystrobin (FRAC11). Oregon SLNs are in place for boscalid (FRAC7) and trifloxystrobin (FRAC11) in crimson clover seed only.

Disease incidence varies by year depending on the weather. Fields are scouted and treated when infections are detected, which may begin as early as January and continue into late April or May when weather conditions remain cool and wet. In low disease pressure years, only one application may be needed for control, where two applications are needed under high pressure conditions. Researchers and industry experts report greater efficacy with iprodione than the FRAC11 alternatives.

Because the industry has so few options available, especially in red and white clover seed, they are asking to retain two annual applications of iprodione so that growers have continued access to the most efficacious tools. Industry experts report that any field activities conducted during this time in clover seed would be conducted via tractor, reducing potential worker exposure. Two uses also allows the industry flexibility in case of supply chain shortages of Quadris (EPA reg. no. 100-1098; azoxystrobin), which is the only other labeled material that can be applied for Sclerotinia in red and white clover seed.

2.c Proposed application prohibitions for ornamentals

The ornamental industry is an under-estimated contributor to PNW economies. Oregon alone reports nursery and greenhouse industry sales at $1.2 billion dollars. A huge range of crops are susceptible to *Botrytis* disease including: African violet, Ageratum, Ajuga, Aphelandra, aster, begonia, Caladium, Calceolaria, carnation, chrysanthemum, coleus, cyclamen, fuchsia, geranium, gloxinia, hosta, Iberis, impatiens, lily, Lobelia, marigold, orchid, pansy, Pericallis hybrids, petunia, poinsettia, primrose, rose, snapdragon, verbena, viburnum, zinnia, and zygopetalum just to name a few of them. Geranium is considered highly susceptible to a point that it could be a significant harbor of the pathogen for other greenhouse crops. Blossom blight, leaf spots, and bud and stem rots are common. Plant parts, such as roots, corms, rhizomes and stems, in cold storage can also be injured.

The issues of resistance and efficacy of alternatives described for other crops in this letter are the same for these crops. The ornamental industries request continued access to iprodione more frequently than one application per year.

2.d Proposed grape application rate reduction

Winegrapes are produced on over 90,000 acres between Oregon and Washington, yielding 285 tons of winegrapes. Iprodione is used across these berry production systems for control of Botrytis fruit rots. As in blueberry and caneberry (see the response to mitigation 2.a), producers utilize iprodione in

production of wine grapes as part of a rotational program to manage Botrytis bunch rot. Typical applications timings for *Botrytis* control are during bloom (June), bunch close (July), veraison (August) and pre-harvest (September, especially if rain leading up to harvest)[19]. As discussed above, continued access to iprodione is important to reduce the resistance selection pressure on the other FRAC groups available for Botrytis control, especially FRAC7 and FRAC17 materials.

While wine grape producers do not need multiple applications per season, the proposed rate reduction to 0.6 lbs ai/A is problematic because of lower efficacy and disease control. Currently, Oregon State University researchers do not recommend applying iprodione at a rate lower than 0.75 lbs ai/A[19,20]. Below this rate, efficacy is lower and more variable, and utilizing a lower a.i. per acre risks increasing the selection of iprodione-resistant strains. The industry requests considering a slight increase in the maximum application rate to 0.75 lbs a.i./A.

4. Proposed label clean-up

To aid our producers in devising acceptable crop rotations, please consider making the label language around rotational crop restrictions consistent. Currently the Proposed Interim Decision has the following wordings for rotational restrictions:

- "Rotational Crop Restriction: Do not rotate to the following crops for one year following application: peanut, rice, beans, caneberry subgroup 13-7, or bushberry subgroup 13-07B." (page 67).
- "The rotational crop restrictions should indicate that only a labeled primary crop may be rotated to a treated field." (page 71)

We are concerned that the specification of one year for some crops and not others will lead to mis-interpretation of the label guidelines.

Summary

- The reduction in application rate and number of applications on golf greens and tees could lead to significant economic impacts for golf courses in the Pacific Northwest. Allowing a higher use rate and an additional application per season will help to mitigate these impacts.
- Iprodione is a critical resistance management tool for *Botrytis* in blueberry and caneberry production in the Pacific Northwest, and revocation of this use will increase resistance development in the remaining alternatives. Retention of a single application of iprodione per season is key to the resistance management strategies employed by regional berry producers.
- Sclerotinia white mold is an economically damaging pathogen in succulent bean production, and alternatives are less efficacious than a tank mix of iprodione + thiophanate-methyl. Retention of iprodione in succulent beans provides control and aids in avoiding resistance development to thiophanate-methyl.
- Crucifer seed crops rely on seed treatments of iprodione for management of black leg, while Oregon producers also utilize up to three applications of iprodione for Sclerotinia watery soft rot

and stem rot diseases. Retention of the seed treatment use plus a foliar use provides for efficacious control of black leg and Sclerotinia.

- Clover seed crops may use two to three applications of iprodione for Sclerotinia crown rot and wilt. There is only one alternative label (Quadris) available in red and white clover seed production. Allowing additional applications per season will provide the most efficacious control option, plus help protect against loss due to supply chain problems, should they occur in the future.
- The ornamentals industry in the Pacific Northwest is very diverse, but overall faces similar disease pressure and efficacy concerns with *Botrytis* as the food crops detailed in this letter, and additional applications per year will aid in control and resistance management.
- The proposed maximum label rate of 0.6 lbs a.i./A for *Botrytis* control in wine grapes is below the recommended application rate of 0.75 lbs a.i./A, which will increase selection of iprodione-resistant strains of *Botrytis*.
- Inconsistent language regarding the timing of planting rotational crops may lead to confusion and inadvertent label violations.

Thank you for the opportunity to comment. Please feel free to contact me with additional questions about iprodione usage in the Pacific Northwest.

Respectfully,

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To compile comments, input is actively solicited from stakeholders throughout the Pacific Northwest in an effort to convey use patterns, benefits, potential impacts, and the availability and efficacy of alternatives. These comments largely reflect expert testimony from stakeholders, including research and extension experts as well as farmers and commodity groups. The comments do not imply endorsement by Oregon State University or the Western IPM Center.

References:

[1]McDonald, B.W. and A.R. Kowalewski (2016). Effects of fungicides on gray snow mold in central Oregon, 2016. Plant Disease Management Reports 11:T008.

[2]Lawn and turf – microdochium patch (pink snow mold). In: Pscheidt, J.W., and Ocamb, C.M., senior editors. 2022. Pacific Northwest Plant Disease Management Handbook [online]. Corvallis, OR: Oregon State University. https://pnwhandbooks.org/plantdisease/host-disease/lawn-turf-microdochium-patch-pink-snow-mold (accessed 2 May 2022).

[3]Lawn and turf – typhula blight (gray snow mold). In: Pscheidt, J.W., and Ocamb, C.M., senior editors. 2022. Pacific Northwest Plant Disease Management Handbook [online]. Corvallis, OR: Oregon State University. https://pnwhandbooks.org/plantdisease/host-disease/lawn-turf-typhula-blight-gray-snow-mold (accessed 2 May 2022).

[4]Blueberry (*Vaccinium corymbosum*) – Botrytis blight. In: Pscheidt, J.W., and Ocamb, C.M., senior editors. 2022. Pacific Northwest Plant Disease Management Handbook [online]. Corvallis, OR: Oregon State University. https://pnwhandbooks.org/plantdisease/host-disease/blueberry-vaccinium-corymbosum-botrytis-blight (accessed 2 May 2022).

[5]Raspberry (*Rubus* spp) – fruit rot and cane Botrytis. In: Pscheidt, J.W., and Ocamb, C.M., senior editors. 2022. Pacific Northwest Plant Disease Management Handbook [online]. Corvallis, OR: Oregon State University. https://pnwhandbooks.org/plantdisease/host-disease/raspberry-rubus-spp-fruit-rot-cane-botrytis (accessed 2 May 2022).

[6]Stockwell, V.O., Shaffer, B.T., Jones, L.A., Pscheidt, J.W. 2018. Fungicide resistance profiles of Botrytis cinerea isolated from berry crops in Oregon. Abstract for International Congress of Plant Pathology: Plant Health in A Global Economy; 2018 July 29-Aug 3; Boston, MA.

[7]Peever, T., D. Dutton, D. Harteveld, O. Kozhar and S. Sabaratnum (2017). Cross resistance of new FRAC7 fungicides for control of gray mold in berries in PNW. Presentation available at: http://whatcom.wsu.edu/ag/edu/sfc/documents/sfc2017/2017SFC_FRAC7Peever.pdf (accessed 2 May 2022).

[8]Saito, S., Michailides, T.J., and C.L. Xiao (2012). Fungicide resistance profiling in *Botrytis cinerea* populations from blueberry in California and Washington and their impact on control of gray mold. Plant Disease, 100: 2017-2093.

[9]Stockwell, V.O., unpublished data. Shared 13 April 2022.

[10]Schreiber, A., J. Adaskaveg, T. Walters, S. Midboe, C. Clemons and T. Peerbolt (2013). Botrytis control in berries. Presentation available at: http://whatcom.wsu.edu/ag/edu/sfc/documents/sfc2013/botrytis.pdf (accessed 2 May 2022).

[11]Ocamb, C.M. and R.B. McReynolds. Bean, snap (*Phaseolus vulgaris*) - strategies for controlling white and gray mold in the same field. In: Pscheidt, J.W., and Ocamb, C.M., senior editors. 2022. Pacific Northwest Plant Disease Management Handbook [online]. Corvallis, OR: Oregon State University. https://pnwhandbooks.org/plantdisease/host-disease/bean-snap-phaseolus-vulgaris-strategies-controlling-white-gray-mold-same-field (accessed 2 May 2022).

[12]Ocamb, C.M., McReynolds, R.B., Cerruti, N.R., and R.E. Peachy (2008). Evaluation of materials for control of white mold in snap beans, 2007. Plant Disease Management Reports 2:V101.

[13]Ocamb, C.M., Bazurto, T., and R.B. McReynolds (2010). Evaluation of materials for control of white mold in snap beans, 2009. Plant Disease Management Reports 4:V086.

[14]Ocamb, C.M., Bazurto, T., and R.B. McReynolds (2012). Evaluation of materials for control of white mold in snap beans, 2011. Plant Disease Management Reports 6:V126.

[15]Ocamb, C.M. (2014). Evaluation of materials for control of white and gray mold in snap beans, 2013. Plant Disease Management Reports, 8:V178.

[16]Seed crop, crucifers (*Brassica* and *Raphanus* spp)- black leg. In: Pscheidt, J.W., and Ocamb, C.M., senior editors. 2022. Pacific Northwest Plant Disease Management Handbook [online]. Corvallis, OR: Oregon State University. https://pnwhandbooks.org/plantdisease/host-disease/seed-crop-crucifers-brassica-raphanus-spp-black-leg (accessed 2 May 2022).

[17]Anderson, N., Qin, R., Tanner, C., and D. Walenta (2021). Oregon legume seed crop estimates. https://cropandsoil.oregonstate.edu/system/files/legumes_18-20.pdf (accessed 2 May 2022).

[18]Clover (*Trifolium* spp.) – Sclerotinia crown rot and wilt. In: Pscheidt, J.W., and Ocamb, C.M., senior editors. 2022. Pacific Northwest Plant Disease Management Handbook [online]. Corvallis, OR: Oregon State University. https://pnwhandbooks.org/plantdisease/host-disease/clover-trifolium-spp-sclerotinia-crown-rot-wilt (accessed 2 May 2022).

[19]Grape (*Vitis* spp.) – Botrytis bunch rot. In: Pscheidt, J.W., and Ocamb, C.M., senior editors. 2022. Pacific Northwest Plant Disease Management Handbook [online]. Corvallis, OR: Oregon State University. https://pnwhandbooks.org/plantdisease/host-disease/grape-vitis-spp-botrytis-bunch-rot (accessed 2 May 2022).

[20]Skinkis, P.A., J.W. Pscheidt, M.L. Moretti, V.M. Walton and A. KC (2022). 2022 Pest management guide for wine grapes in Oregon. Oregon State University Extension Publications, EM8413.