Spruce bark beetle (*Ips typographus*) infestation cause up to 700 times higher bark BVOC emission rates from Norway spruce (*Picea abies*)

Biogeosciences: bg-2022-125

This study is interesting and has its own important value to supplement what has been done previously and giving new information about bark beetle infestation effect to BVOC emission from Norway spruce bark. A lot of confusing information and weak Discussion is not helping to reveal this experiment value. Important part is also the new emerging volatiles, but these get so little attention or no attention in Discussion part. Discussion part is weak and needs more improving, more references and discussion that is connected with result and putting the results in bigger picture. I suggest leaving out the comparison with leaf emission; this does not give an extra value to the study. This has opposite effect: to diminish your efforts.

Through MS: commas are there where they are not supposed to be and at the same time missing where they should be. I suggest to ask some native speaker to check English (my English is also not so good, but based on my experience I guess I understand when English needs improving). A lot of using %, this does not make the MS better. Try to find better alternative for this to describe results. Important part is also the new emerging volatiles, but these get so little attention or no attention in Discussion part. Discussion part is weak and needs more improving, more references and discussion that is connected with result and putting the results in bigger picture. I suggest leaving out the comparison with leaf emission; this does not give an extra value to the study.

1) Title says: "...cause up to 700 times higher emission..." – but compared to what?
2) L14 – drilled – used one style trough MS: drilled or boring; instead "entry holes and exit holes" use "entry and exit holes", check whole MS
3) L15 – instead "healthy trees and infested trees" used "healthy and infested trees"; write out site names in abstract
4) L21 – decreasing relationship – is it statistically true?
5) L28 – " This study…." This kind if sentence fits better to Conclusions
6) L54 – "..SOA." – add reference
7) L55-56 – better use "negative or a positive feedback loop..."
8) L57-58 – form a better sentence
9) L63 – any references from last 10 years? If yes, add.
10) L10 - any references from last 10 years? If yes, add.
11) Trough MS – I suggest to use Norway spruce instead of (just) spruce when related to your experiment and *xyz* spruce when related to specific reference, if possible
12) L78 - I guess it's not poorly understood, because every experiment gives valuable information, but of course depending of the aims
13) L81 – Connections with what? Some words missing?
14) L82 – For me the bark emission comparison with needle emission is not giving this MS much more value. Needle emission and bark emission measurements from spruce should be standalone experiment.

15) L84-90 – I suggest not to use we/our etc for this part (check also trough MS). For the reader would be helpful to find hypotheses easily when they are numbered 1,2,3 etc and hypotheses presented clearly and properly.

16) L87 –"...eventual death of the tree" – I assume you did not measure the tree until it's eventual death. How long does it take when the tree is dead or considered dead after bark beetle infestation?

17) L89 – "total number of holes" – what do you mean in "total number of holes"? Entry+exit holes?

18) L91 – You did not investigate blue stain fungi in this experiment – I suggest to use blue stain fungi in discussion part.

19) L92 – "tree individuals" – I suggest "two trees"

20) L99 – I suggest that in this sentence indicate table 1 for campaign dates

21) L96 –Based on this sentence I would expect that in a sub-study where more than one campaign but it's written over time. For me it indicates more than one campaign.

22) L101 – use one style: sub-study or additional campaign trough MS

23) Figure 1 – how are the rules for figure legends, is there a dot or semicolon after Figure 1? What is the rule for figure legend text - needs to be in **bold**? I like the map for showing, but describing b-c-a is not common in figure legends also in text (like Fig.1b). If possible, change maps etc. starting with abc and in figure legends also describing abc. Missing proper explanations what yellow squares and circles mean. "The Figure..." –why is there **F**igure not **f**igure? If possible, write out in the legends which site had healthy and infested trees, and where was sub-study done.

24) L122 – "by visual examination" – meaning no entry holes?

25) L123 – Indicate site name

26) L120-125 – write out here which was here considered as sub-study

27) In Methods part, please consider clearly explaining healthy, infested and control, because later you show also control measurements and use the same style trough MS.

28) L130 – check names and ALL NAMES in MS must be correct, many mistakes: alpha-pinene, α-pinene, beta-pinene, β-pinene etc and other names written not well.

29) L130 – Typosan- company name?

30) L132 – repeatedly: measurements dates are indicated where?

31) L136 – indicate figure

32) L137 – use one style trough MS 5°C to 22°C or 5° to 22°C

33) L138 – start with May and then with June

34) Figure 2 – in figure legends start describing with temperature as you have on the figure temp, precip, campaign. Figure legend text in bold? I suggest writing out in a better way where data was taken.

35) L147 – pump company? I guess L/min is visually better than lpm. 0.6-0.9 L.

36) L148 – "Ad sorbent tubes…" goes to VOC collecting part

37) L153 - 40°C or 40 °C – use one style trough MS

38) L155 – I suggest here to use diameter, not inches; PTFE-tubing or PTFE-lines?

39) L158 – "each sample" – do you mean here each VOC collection?

40) L160 – so the first VOC measurement was at 8:00 in the morning or you started to put the chamber bases on tree?

41) L166 – Can you add the info when the infestation (swarming time) was detected. "For plot 3" indicate plot name. "…witnessed on site." – when?

42) L168 – based on data from Skogsstyrelsen database, when was the proposed swarming time?
43) L170 – Did you mark the entry/exit holes to distinguish new and previous entry/exit holes?
44) "By looking at bark photographs…" – I suggest to use "photos" and it's the first time to indicate figure 4, so, in the end of sentence, indicate figure, not in the next sentence.
45) L173 – Rewise sentence – I suggest not to start the sentence with "table 1".
46) Figure 3: On figure you have VOC filter, but in Methods part there is no info about VOC filter. Is it the same as nets? "A photograph of how the setup looked in the field is displayed to the right (b)." – I suggest revising. "The BVOC samples were.." - add here the pocket pump also. Add tree name or latin name.
47) Figure 4: which tree – add name or latin name. Correc to " entry and exit holes". Photos where done by who? Drilled or bored?
48) Table 1 – text in bold? Which infested tree –add name. Which site/area trees belong? Table paragraph spacing. "exit and entry holes". There is no explanation what S1S1 etc mean? "Type majority"-> "Hole type majority". If possible add spruce initial health status also – healthy, infested etc.
49) L190 – I suggest to add in this paragraph how much healthy and infected tree BVOC measurements were done in total
50) L191 –Tenax company? Carbograph company?
51) L194 – Why was the collecting time 5 to 6 L not exactly 5 L or 6 L?
52) L196 – "twice a day" – can you say at least before mid-day or after mid-day? Or when?
53) L197 – "at the start of the BVOC sampling and at the end"-> "at the start and at the end of the BVOC sampling"
54) L198 – "After sampling.." - does this sentence repeat the previous sentence? "During sampling period"?
55) L205 – He, which company He?; VOC or BVOC – use one style trough MS
56) L210 – space between number and m/mm
57) L220 – Shimadzu… - country?
58) 2.4 – ALL equations need numbers and indicated in the MS where necessary
59) L225 – in equation the A is normal, but in describing text it is A (italic)
60) L243 – For me you have three ways to describe 1) 100 days before/after; 2) majority entry and /or exit holes; 3) early and late season. And all these three are used trough MS. I suggest to explain this well in this paragraph and use one style trough MS and also on figures and figure legend text.
61) L256 - Q in italic?
62) L258 – F in italic?
63) L262 – F and Q in italic?
64) 269 –Eq 4 – where, which one?
65) L270 – Eq 5 – where, which one?
66) L270 – I suggest explaining in Methods part: does constitutive mean healthy or control tree emission. And what is considered as control, because later on the figures you have a control.
67) L274 – 3 m
68) L275 – North, East? north? east? - Look trough MS that weather arc are correctly. I suggest that weather arcs info goes in BVOC collecting paragraph.
69) L276 – I'm not so fond of comparing bark emission with leaf emission. This should be extra study to compare with more measurements campaigns. For me this comparison does not give an extra value to this study (overall). For me the core of the study is bark emissions from infested and

<u>healthy trees</u> and then finding important results to discuss on Discussion part and with SOA and climate change and modelling (MEGAN etc).

70) L282 – outliers from which sites/area? I suggest moving this paragraph closer to BVOC sampling paragraph. "Photography"->"photos"

71) 2.5 Statistical studies – Needs a lot improving. In here also clarify which measurements, from what area/sites, what about constitutive etc, what about sub-study? Look my comment before. P in italic (*p*)? Same with F and Q. Clearly write out what did you compare and with what statistical test and which program did you use for it.

72) Should there be dot in each main/second headline, like 3. Results/ 3.1. zyx ?

73) 3.1. – Revise the tile if clarifying "constitutive" in previous MS parts

74) L294 – constitutive=healthy? Is it temperature-standardized or temperature standardized? Use one style.

75) L296 – indicate the results in table X if they are written out in table.

76) L301 - The numbers here and on the figure are not well trackable/comparable and at the same time quickly understood on the figure. If I read the sentence and look at the same time on the figure, cannot distinguish quickly what is what and figure is hard to read for a reader who does not read the results part about this figure.

77) L303 – p-value? *p*>0.3. <u>Make changes through MS.</u>

78) L304 – which sites in what area?

79) Add on Figure 5 HTM, so the reader can understand what area without reading figure-describing text. In describing text, indicate statistical test. What n means? What black circles mean?

80) L311 – infested trees in which area?

81) L312 – drill or bored? "The season…" – you were describing it before in Methods part, in here use one style to indicate, but not repeating the same as in Methods. Look my comment before.

82) L314 – I suggest to add total emission also to Table 1.

83) L315 – "..µg m-2 h-<mark>1</mark> . MTs…" check space. " MTs…" indicate for table 2.

84) L319 – 42% or 42 %? Use one style thorough MS.

85) L322 – Which trees: name? Which area? Name? BVOC or VOC?

86) L323 – healthy from which area?

87) L328 – infested tree: I suggest to use infested bark samples, bark emissions, infested tree bark etc through MS, one style through MS.

88) 329 – "isoprene, (n = 17) compared " check the mistake. Infested trees in which area?

89) L331 – indicate table

90) L337 – Which areas/sites? P value – how come 0.00???? "The median…" - Consider writing this sentence according to this what is shown on figure or change figure according to the sentence. I advise to start with healthy and then infested (early, late). I suggest to use less "respectively" through MS, not so easy to follow.

91) Figure 6 - please add also HTM or NOR on the figure. Which tree? Again use one style for early/late season, exit/entry. "The emission rate.." sentence doesn't belong to figure describing text. P-value?? Standardized to temperature – indicate equation in XX part. Explain yellow and blue. Statistical test used?

92) L349 – healthy ~~trees~~ and infested. Which sites/area???

93) L315 – I suggest rounding the numbers to proper value in table, visually better. Overall, it's kind of disturbing using so much % through MS.

94) Check VOC names trough MS.

95) L287 – Again, using % and even so big numbers….do you use 22678 or 22 678? Which area, which site trees? Which trees?

96) L374 – when it's the first time indicating Appendix, write out Appendix, otherwise what Table A1 means? trans, trans-alloocimene - > maybe (4E,6E)-alloocimene better?

97) L375 – gamma-terpinene or γ-terpinene? "in infested…"- revise end of the sentence, double repeat

98) Table 2 – paragraph spacing. Which tree? Which area? STDEV is only for groups, not for each compound. Explain MT, SQT. What about decrease (-65%), not explained, only increase. Again numbers: 22678 or 22 678? Check all the names in table, all the names need to be used correctly trough MS (tables, figures, etc). If possible add total emission.

99) 386 –Which area? Which trees? Number 13000?

100) L390 - "...daily average standardized emission.." – check

101) L391 – "The average number of holes per square meter bark area found in this study was based on the values in Table 1." Revise or delete.

102) L396 – Whole sentence "For…." – check and correct. Are here the results of sub-study?

103) L400 – "The TS emission…" – I guess this sentence is to long for explanation, I suggest to divided in two parts and describing clearly. I guess this kind of description goes to Methods part in Statistics.

104) Figure 7 – Which trees? What area? S3S2, S3S3, etc meaning? Early/late, 100 days before/after. "The emission rates…" and "This is evident…" sentences do not belong to figure describing text.

105) 3.2 – Did you to statistics to evaluate influence of time?

106) L413 – Which site/area? Indicate table/figure.

107) L415 – Where is 3.2.3? I suggest to put function to Statistics part and indicating on the figure describing text where to find it.

108) L420 – use one style trough MS: 8b and 8d or 8b,d etc.

109) L421 – I guess "slightly" is not correct to use here. "..depending..." revise, double repeat.

110) L425 – How long does it take from infestation to total damage/death to the tree? Maybe something to discuss in Discussion and some info for introduction part?

111) L428/429 – indicate figure. Again constitutive/healthy emission? Area?

112) L432 – "The tree measured.."- did it have a name SxSx? What area?

113) L434 – indicate figure

114) L435 – Too long sentence. Revise. Make it easier to read. And indicate figure.

115) Figure 8 – VOC names!!! Which trees? What area? "..days ~~passed~~ since..". Correclty put abcd to figure describing text, (a) is in a wrong place and (d). Blue is for what? Did you include yellow marked tree also in the fitting? Revise sentence for clearer understanding. What test is used here? In Methods part there is no indication about measurements after 300 days.

116) L445 - entry ~~holes and exit holes~~

117) L450 – indicate tableX?

118) L452 – check names!

119) L453 – 9b,d – look my comments before.

120) L455 – indicate table

121) Figure 9 – check names. Which area. Change the order top of the figure: first are entry holes and then exit holes. Relationship p value? Which test was used? Which trees? Again (a), (b), etc to correct order. All or total BVOC. The "2" on the x-scale title is to big. "High…" sentences does not belong to figure describing. Again: exit/entry, late/early, 100 days before/after. "There is a disctinion.." – revise.

122) 3.4 - sub-study?

123) L466 – Revise sentence "At plot 3…" and indicate figure. On another way L466-L469 is describing what you said before, I suggest revise this sentence. Which area?

124) L470- P in italic.

125) L471 - Control trees – what does the control trees mean in MS? Control - not at all infested during campaign or beginning of campaign not infested and later experiencing bark beetle infestation? Indicate figure 8 correctly.

126) L473 –Which other trees? Other trees in plot 3 or somewhere else? Indicate a tableX?

127) L576 –" a difference.." indicate table if possible

128) L477 – check names; I suggest to remove 800 ug or use another number for comparing.

129) L479 - check names

130) L480 – indicate figure, I suggest that p<0,03. Delete "and close to zero", check names

131) L483 – p italic

132) L484 – indicate figure

133) L485-495 – Again less % or even when presenting choose important results, because this part is interesting. I suggest this part to discuss in Discussion part. Check names. "..by mass" – what mass?

134) Figure 10 - Months names ith capital letter. On the figure, where is asterix-what does it indicate? Can't be seen. Check names! All figure plot need to have month names. Describing text what trees, what area. Why no SE? Add tick marks on the figure, other figures have. Remove the outer box from top of the figure, where are indicated control, S3 and S2 and add some space between them for clearer separation. Start with control in describing text, then healthy or infested etc. Add year in describing text. "For", I guess "from". In this figure, there is important info, but this does not come forward clearly because of figure negative sides. Maybe another alternative?

135) L506 – F in italic? Q in italic? Look through MS

136) L507 – which area?

137) L508 – indicate a table

138) L510-511 – double repeat

139) L513 – 34900

140) L510-520 – too much %

141) L521- coefficient?

142) L526 – p<0.05 and p<0.01

143) 3.6 – As is said before: for me leaf emission does not give an extra value for the study. Maybe to leave this part out and present the result what are in this chapter? Again which area?

144) L537 – Ms or M_s?

145) L558 – well?

146) Figure 11 – pleases start with abc, revise figure then. Which tree, which area? Again: north, east, North, East? Meters -> m. Which ONE infested tree (SxSz?), which area? What green and purple shades are representing? Add tick marks on y-scale.

147) 4. Discussion – needs a lot improving. Right now it's weak. Indicate table and figures where proper. Check names. What areas? More references and discussions. Somehow Discussion part repeats Results part, would be better to have more discussion about results.

148) L587 –what relationship? How did you calculate this? Assessing how? Based on what? No info in Methods. Any references about lichen cover related to isoprene emissions. Ghimire – how did they assess? Statistically or also visually?

149) L591 – healthy and infested trees – what previous findings? References? Some examples for describing? Indicate figure.

150) L591 – repeating of the results. I suggest to put these number into comparison with some references if possible or to discuss about emissions. I suggest not to use "we".

151) L549 - And so what it is higher at the beginning? Connect the higher emission with atmospheric processes, add references. What is different in the beginning? Indicate your figure/table if proper.

152) L583 – 605: all compared to one reference.

153) L599 - time...what about temperatures, weather conditions? And what time, measuring time during day (morning, lunch time, evening) or campaign times (certain dates).

154) L600 – "study…" indicate figure

155) L601 – Ghimire – which holes in this reference?

156) L602 – "this allowed…" then what is done before? References? What stage to what stage?

157) L604 – "This finding.." – what finding exactly? Why it is important in bigger picture?

158) L605 – "We could see..."- is it really a trend or rather something normal to be expected when more time passes since infestation.

159) L608 – check space

160) L609 – references, more to discuss with few sentences?

161) L611 – indicate figure

162) L612 – which total holes, majority of entry or exit holes? Or entry+exit? To discuss what could be the possibilities for no pattern. Any references where this kind of pattern occurs?

163) L614 – indicate figure

164) L616-617 – references. Too long sentence, I suggest to make into two sentences. Double repeat.

165) L618 –VOC`

166) L619 – which individual tree, which area?

167) L620-629 – References.

168) L624 – All trees – what area?

169) L628 – any reference to support your results and conclusion?

170) L631 – indicate table/figure if proper

171) L630-639 – add references and something to discuss more than these two references

172) L635 – oxygenated monoterpenes?

173) L639 – any references to add?

174) L640 – 4.1.1.- Only 3 references per this part?

175) L682 – what other 16 BVOCs? Revise, no need to add BVOC names exactly.

176) L700- "As the…" double repeat.

177) 684 and 690 – both sentences are a repeat. " This could.." and "This change.."

178) L685 – Myrcene sentence goes rather to Results part.

179) 4.2 – again % and numbers. Now here Ips typographnus – why not bark beetle as trough MS? Only 5-6 references per this part?

180) Table A1 – Names: numbers; MT, SQT explanation – check comment for table 1.

181)