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Interactive comment on "Optimizing the impact of temperature on bio-hydrogen production from food waste and its derivatives under no pH control using statistical modelling" *by* A. Sattar et al.

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We thank you very much for your useful evaluation. Below are responses to your comments. Comment: Most of the literature is adequately referred to postulate the hypothesis, however the studies conducted under psychrophilic temperature conditions should be added to provide better understanding to the readers. Answer: Studies regarding psychrophilic conditions are incorporated as"Lu et al. (2011) developed a microbial electrolysis cells (MECs) that could be operated at 9°C by using Geobacter psychrophilus as dominating population and achieved hydrogen yield of 0.62m3H2m-3d-1. Heidrich et al. (2013) further modified MECs to a pilot-scale MEC

and achieved bio-hydrogen production of 0.015 LH2L-1d-1 at 25°C. On the other end, under mesophilic and thermophilic conditions, there is no need of such sophisticated technology and a better bio-hydrogen yield can be achieved by simple reactors or by lab scale batch experiments. The temperature shift from mesophilic to thermophilic conditions can change the rate of hydrogen production during anaerobic digestion (Li and Liu, 2012;Saripan and Reungsang, 2014)" Comment: Page 12831-32, the discussion about hydrogen production with time focused on the quantity of hydrogen produced in term of volume (mL), which is not suitable for readers. So it is better to represent in term of percentage of total hydrogen production observed for specific waste under specific conditions. It can improve the representation of results and develop better understanding. Answer: The discussion is revise as "During 0-24 hours of incubation, bio-hydrogen increased with increase in temperature for food waste, i.e. 115 mL of bio-hydrogen was produced at 37°C that increased 76.09 % and 152.17% at 46°C and 55°C, respectively. During next 24 hours of incubation, bio-hydrogen production reduced with the increase in temperature, i.e. 114.5 ml bio-hydrogen was produced at 37°C and 30.78% and 91.22% reduction was observed at 46°C and 55°C, respectively. Even after reduction in bio-hydrogen production during 24-48 hours of incubation, the cumulative bio-hydrogen production increased with an increase in temperature from food waste. It revealed the fact that first 24 hours are important for bio-hydrogen production from food waste under thermophilic temperatures and next 24 are important for production under mesophilic temperature, which is in agreement with findings of Shin et al (2004). Although noodle waste also produced more bio-hydrogen at elevated temperature, but the time effect was opposite to that observed for food waste. The bio-hydrogen production in noodle waste during 0-24 hours was 350mL at 37°C that was 5.4% and 10.81% decreased at 46°C and 55°C, respectively. But in next 24-72 hours, 178.57% and 357.14% increase at 46°C at 55°C, respectively. So far rice waste was concerned; it has a negative impact of temperature on bio-hydrogen production. The bio-hydrogen production in rice waste during 24-48 h was 131 mL, 114.5 mL and 98 mL, which was 65.65% , 75.11% and 87.76% reduced during 48-72h

under 37°C, 46°C and 55°C, respectively. The reduction in bio-hydrogen production for rice waste was in agreement with previous findings (Fang et al., 2006)." Comment: Page 12833, line 6-9, How the decrease in COD removal efficiency was observed with an increase in temperature? Answer: The bio-hydrogen yield was calculated by dividing the bio-hydrogen production with remove quantity of COD. If the increase in yield is higher than bio-hydrogen production than it means that the dividend is small. It only happened when the rate of increase in hydrogen production was higher than rate of COD removal. The discussion is revised as "When the yield measuring scale was shifted from VSremoved to CODremoved, the results represent quite different picture of temperature impact. The increase in temperature from 37°C to 55°C increased 42.41% bio-hydrogen yield calculated on CODremoved basis for food waste whereas the increase due to same increase in bio-hydrogen production due to temperature increase was 23.37%. Such difference in yield and production increment represented decrease in COD removal efficiency at elevated temperature for food waste" Comment: Page 12832, line 21-22 need revision Answer: Revised as "The bio-hydrogen yield calculated on the basis of VSfed lay in the range achieved by Lin et al. (2013b) and temperature impact on yield was same as observed for P" Comment: Page 12833, line 7, need grammatical revision Answer: Revised as "When the yield measuring scale was shifted from VSremoved to CODremoved, the results represent quite different picture of temperature impact" Comment: Page 12833, line 27, reconsider the duration mentioned 28-72 or 24-72 Answer: Revised as "24-72" Comment: Page 12835, line 20-21 need grammatical revision Answer: Revised as "The higher concentration of VFA can also be used as an indicator for higher production of bio-hydrogen production as observed by Dong et al. (2009)."

Please also note the supplement to this comment:
http://www.biogeosciences-discuss.net/12/C5317/2015/bgd-12-C5317-2015-supplement.pdf

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