



4 Conclusion

From the description above it can be concluded that:

1. *Bacillus circullans* can produce hydrogen and acetic acid.
2. The best results for the hydrogen is mixed culture of BC (I + II), while for acetic acid is mixed culture of BC (I + II + III).
3. *Bacillus circullans* produce low hydrogen content due to the fermentation time just 72 hours. Therefore, this research needs to continue to examine the best fermentation time.
4. There has never been found (*Bacillus circullans*) that produce hydrogen. Some strains of *Bacillus ciecullans* produce cellulase enzymes, xylanase, poly hydroxy alkanolic (PHA), poly hydroxy butanoic (PHB) etc. So it can conclude that *Bacillus* were found from this study is a new strain of *Bacillus circullans*.

5 References

- [1] Pieterneel A.M. Claassen, Truus de Vrije, Emmanuel Koukios , Ed van Niel, Inci Eroglu, Michael Modigell, Anton Friedl, Walter Wukovits, Werner., *Non-thermal production of pure hydrogen from biomass: HYVOLUTION*. Journal of Cleaner Production 18, pp54-58, 2010.
- [2] Elif Kirtay. *Recent advances in production of hydrogen from biomas Energi Conversion and Management*, 52, pp 1778–1789, 2011.
- [3] Hidayet Argun, Fikret Kargi. *Bio-hidrogen production by different operational mode of dark and photo-fermentation: An overview*. International journal o f hydrogen energy, 36, (74), pp 43 -749, 2011.
- [4] Pieterneel A.M. Claassen, Truus de Vrije, Emmanuel Koukios, Ed van Niel, Inci Eroglu, Michael Modigell, Anton Friedl, Walter Wukovits, Werner Ahrer. *Non-thermal production of pure hidrogen from biomass: HYVOLUTION*. Journal of Cleaner Production, 18, pp 54-58. 2010.
- [5] Rana Sagnak, Fikret Kargi, Ilgi K. Kapdan. *Bio-hidrogen production from acid hydrolyzed waste ground wheat by dark fermentation*. International journal of hydrogen energy, 36, pp 12803 – 2809, 2011.
- [6] Serpil Ozmihci, Fikret Kargi, Ayse Cakir. *Thermophilic dark fermentation of acid hydrolyzed waste ground wheat for hidrogen gas production*. International Journal of hydrogen energi 36 (2011) 211-217.
- [7] Amina Benkiar, Zaraï Jaouadi Nadia, Abdelmalek Badis, Ferial Rebzani, Boulkour Touioui Soraya, Hatem Rekik, Belgacem Naili, Fatma Zohra Ferradji, Samir Bejar, Bassem Jaouadi. *Biochemical and molecular characterization of a thermo- and detergent-stable alkaline serine keratinolytic protease from Bacillus circulans strain DZ100 for detergent formulations and feather-biodegradation process*. International Biodeterioration & Biodegradation, 83, pp. 129-138. 2013.