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SUMMARY AND CONCLUSION

In the past, whey had been considered as waste. The addition of salt during biochemical action causes more whey to be separated off. Whey should be recovered and reused if possible. This will have less effect on the environmental and social aspects.

Domiate cheese, which traditionally made from milk salted with 5-15% NaCl, this was very significant problems in the field of dairy production and cheese industry. Thus, the present study was contributed to solve these problems. It was aimed to induce recombinants in *Lactobacillus* strains could tolerate higher concentration of NaCl via bacterial mating technique and adaptation to high saline concentrations. In addition to, assimilation the wastes of

Dairy industry containing lactose to be bioconverted to lactic acid and biosafety single cell protein. Though, this study has been very important in the application of recycling environmental wastes containing lactose via recombinant *Lactobacillus*.

The results obtained from this study could be summarized as follows:

- 1- *Lactobacillus* strains varied in their resistance to antibiotics, heavy metals and NaCl. These variations were used as the opposite genetic markers in mating experiments, as well as, it were a selectable markers for isolated transconjugants.
- 2- All *Lactobacillus* strains could tolerate 4% NaCl. However some of them were tolerate over than 4%, *Lactobacillus casie* sub *casie* revealed NaCl tolerance up to 7%.
- 3- Different levels of temperature more than optimum (28°C) resulting elimination of plasmid DNA, however, higher temperatures (37 and/or 40°C) resulted higher frequency of plasmid free cells.
- 4- *Lactobacillus* strains; L14, L34 and L19 were adapted from 4% to 7% NaCl, whereas, strain L44 adapted from 5% to 7.5% NaCl. In addition, L56 was adapted from 7% to 10% NaCl.
- 5- Isolates of *Lactobacillus* strains resulted from adaptation were retested after 30, 60 and 180 days to the final concentration of NaCl. This appeared variations in their stability of tolerance.

- 6- Antibacterial test against bacteriocin revealed that, all *Lactobacillus* strains were resistant to tetracin, moreover *Tetragenococcus halophilus* (*Pediococcus halophilus*) was resistant to lactocin.
- 7- The time needed to appear transconjugants on selective media was differ from mating to another which may be due to the factors affecting on transfer frequency, the age of donor and recipient cultures and DNA-protein relaxosome .
- 8- Four matings from five succeeded to appear in time I (10-15 day), whereas the five was succeeded at time (30 day).
- 9-Transconjugants resulted from a long time of mating (II) appeared an increase in their efficiency of salt-tolerance .
- 10-*Lactobacillus* transconjugants resulted from the mating between; T14 x L14, T14 x L56 (except Tr28), T14 x L34, T19 x L36 and T14 x L44 (except Tr44) appeared significant increase in growth percentage at 5% NaCl .In addition, transconjugants resulted from the mating between; T14 x L14 , T14 x L56 and T14 x L44 appeared significant increase in growth percentage over the mid parents at 7.5 % NaCl .
- 11- In small-scale batch fermentation of salty cheese whey L43 (A1, A2) and L19 adapted isolates (A1) gave significant increase in biomass yield, conversion efficiency, lactic acid yield and conversion efficiency over the parental strains.
- 12-Transconjugants resulted from the mating between T.14XL56 (Tr1, Tr2, Tr3, Tr4, Tr5) revealed significant increase in growth percentage in relation to the mid parents .In addition , transconjugants from Tr5 toTr10, Tr11 to Tr15, Tr17 to Tr20 except for Tr19, Tr22 to Tr24 and Tr32 to Tr35 appeared significant increase in biomass yield and its conversion efficiency.
- 13- Transconjugants resulted from the mating between T14 X L56 (I) except for ; Tr3 and Tr5 , T14 XL44 (I) except for Tr16 and Tr20 ,as well as, the trasconjugants resulted from mating between T14 XL14 appeared significant increase in lactic acid production.
- 14-Transconjugant isolates; Tr8, Tr13, Tr14, Tr18, Tr22, Tr24, Tr25 and Tr40 appeared significant increase in lactic acid conversion efficiency.

SUMMARY AND CONCLUSION

- It can be concluded that the different recombinants of *Lactobacillus* could be use to bioconverting lactose in cheese whey to lactic acid and biosafety single cell protein with significant bioconversion efficiency than their parental strains.
- This study was an environmental friendly via recycling the whey resulted from cheese industry using different recombinants of *Lactobacillus* strains to reducing environmental pollution .