3.5. Evaluation of the intestinal absorption of insulin-loaded nanoparticles by *in situ* intestinal perfusion technique

To examine the biological effect and intestinal uptake of insulin-loaded nanoparticles formula, the oral insulin formula was administered to full-length intestine. In addition, Rh-insulin solution was perfused to compare the intestinal absorption between the oral preparation and the insulin solution. Moreover, the *in situ* perfusion study was carried out with normal and diabetic rats to evaluate the differences in insulin transfer between healthy and STZ-induced diabetes intestine.

The profiles of percentage of all results are shown in (Figure 3.11-20). The glucose levels of normal rats after intestinal perfusion of Rh-insulin formula presented in (Figure 3.11) and compared it with effect of subcutaneous insulin. The maximum decrease in glucose level after insulin perfusion was obtained at 30-40 min, then the glucose level started to increase again, while the perfusion of placebo with subcutaneous insulin that used as reference group shows continuing decline in glucose level.

On the other hand, (Figure 3.12) shows the same comparison in diabetic rats. Glucose levels after insulin solution perfusion did not change. However, after subcutaneous injection in the diabetic rat decrease in blood glucose was observed.

The pharmacological action of insulin after perfusion through intestine was compared between normal and diabetic rats in (Figure 3.13). Significant reduced glucose level in normal rats was obtained from 30 to 60 min ($p<0.05$). The comparison of insulin subcutaneously effect between diabetic and non-diabetic rats was presented in (Figure 3.14). In particular, Placebo perfusion with SC insulin causes a reduction in blood glucose concentrations significantly from 30 to 60 min in normal rats ($p<0.05$).