Swine manure mono-digestion often results in economically non-feasible processes, due to the high dilution and ammonia concentration together with the low degradation rates it presents. The effects of different parameters of Aqueous Ammonia Soaking (AAS) as a pretreatment for improving the digestion of manure fibers when coupled to an ammonia removal step were investigated in this study. Response Surface Methodology was followed and the influence and interactions of the following AAS parameters were studied: NH₃ concentration, duration and solid-to-liquid ratio. The mild conditions found to be optimal (7% w/w NH₃, 96 hours, and 0.16 kg/l) in combination to a significant increase of the short term CH₄ yield (244% in 17 days), make this pretreatment a promising solution for improving swine manure mono-digestion. Furthermore, compositional analysis of the manure fibers revealed significant solubilization of hemicellulose, while no lignin removal or loss of cellulose occurred under optimal conditions.