

# Hidrogel superabsorben kitosan-polistirena dengan metode semi-interpenetrating polymer network (semi-IPN) sebagai substrat untuk slow release pupuk NPK = Hydrogel superabsorbent chitosan polystyrene with semi interpenetrating polymer network (semi-IPN) method as a material for slow release fertilizer NPK

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## Abstrak

Untuk meningkatkan efektifitas penggunaan pupuk pada media tanam, dilakukan modifikasi terhadap pupuk sehingga menjadi pupuk lepas lambat. Dalam penelitian ini, pupuk NPK yang disintesis mengandung urea, amonium dihidrogen fosfat, dan kalium dihidrogen fosfat. Enkapsulasi pupuk NPK menggunakan hidrogel semi interpenetrating polymer network (semi-IPN) berbasis kitosan dan polistirena dilakukan dengan metode in situ loading dan post loading. Komposisi hidrogel kitosan-polistirena semi-IPN yang digunakan terdiri dari kitosan : stirena yaitu 80:20 dan menggunakan agen pengikat silang 5% asetaldehid 0,1 M. Karakterisasi pembentukan hidrogel kitosan-polistirena semi-IPN dan hidrogel kitosan dilakukan menggunakan spektrofotometri Fourier Transform Infrared (FTIR) dan mikroskop stereo. Uji pendahuluan seperti rasio swelling dan derajat ikat silang juga diselidiki. Efisiensi loading pupuk NPK dengan metode in situ loading mencapai 92.96% lebih besar daripada metode post loading yaitu 48.91% diukur dengan menggunakan spektrofotometer UV-Vis. Studi pelepasan pupuk NPK dari matriks hidrogel kitosan-polistirena semi-IPN dilakukan secara gravimetric dan spektrofotometri. Hasil uji pelepasan pupuk NPK yang terenkapsulasi dalam matriks hidrogel secara in situ loading lebih rendah dibandingkan secara post loading. Sifat lepas lambat dan kemampuan retensi air yang baik menunjukkan bahwa hidrogel kitosan-polistirena semi-IPN terenkapsulasi NPK berpotensi untuk aplikasi di bidang pertanian sebagai material pembawa pupuk.

*To improve the effectiveness of the use of fertilizer in the planting medium, the modification of the fertilizer was conducted to achieve a slow-release fertilizer. In this study, NPK fertilizer which contain urea, ammonium dihydrogen phosphate, and potassium dihydrogen phosphate was prepared. Encapsulation of NPK fertilizer using the semi-interpenetrating polymer network (semi-IPN) and polystyrene-based chitosan hydrogels was conducted using in situ loading and post-loading. The semi-IPN chitosan-polystyrene hydrogels were composed of chitosan: styrene monomer with 80:20 ratio and 5% acetaldehyde 0.1 M has been used as crosslinking agent. Characterization of semi-IPN chitosan-polystyrene hydrogels and chitosan hydrogels has been done using Fourier Transform Infrared (FTIR) Spectroscopy and stereo microscope. Preliminary test such as swelling ratio and the degree of crosslinking was also investigated. Efficiency Loading NPK fertilizer with in situ loading method was found to be 92.96% which was greater than the post-loading method which 48.91% . the efficiency loading was measured by using UV-Vis spectrophotometer. Study of NPK fertilizer release from the chitosan hydrogel matrix semi-IPN-polystyrene was determined by gravimetric and spectrophotometric methods. Release of NPK fertilizer encapsulated within a hydrogel matrix by in situ loading was found to be lower than in post loading. Slow-release property and good water retention capability indicates that the chitosan-polystyrene hydrogel semi-IPN encapsulated NPK has a potential for applications in agriculture as a fertilizer carrier material.*