UNIVERSITAS
GADJAH MADA
**Perancangan Kandidat Analog Agonis Gonadotropin-Releasing Hormone (GnRHa) secara In Silico dan
Pengujian In Vivo pada Ikan Zebra (Danio rerio Hamilton, 1822)**
Rahma Aulia, Dr. Dini Wahyu Kartika Sari, S.Pi., M.Si.; Dr. Ir. Triyanto, M.Si.
Universitas Gadjah Mada, 2026 | Diunduh dari http://etd.repository.ugm.ac.id/

INTISARI

Perancangan Kandidat Analog Agonis *Gonadotropin-Releasing Hormone* (*GnRHa*) secara *In Silico* dan Pengujian *In Vivo* pada Ikan Zebra (*Danio rerio* Hamilton, 1822)

Stimulasi hormonal banyak digunakan untuk mengatasi ketidaksinkronan kematangan gonad induk jantan dan betina pada ikan budidaya. Ketergantungan terhadap hormon sintetis impor mendorong pengembangan analog agonis *Gonadotropin-Releasing Hormone* (*GnRHa*) sebagai alternatif yang dapat dikembangkan secara mandiri. Penelitian ini bertujuan untuk merancang kandidat analog *GnRHa* yang berpotensi menstimulasi pemijahan ikan secara *in silico* dan mengevaluasi efektivitasnya secara *in vivo* menggunakan ikan zebra (*Danio rerio*). Perancangan analog dilakukan melalui pendekatan *molecular docking* menggunakan 10 model reseptor *GnRH* (*GnRHR*) dari berbagai spesies ikan. Total sebanyak 512 kandidat analog *GnRHa* diseleksi melalui tiga tahap. Proses seleksi menghasilkan satu kandidat analog *GnRHa* yang dipilih untuk disintesis, yaitu analog dekapeptida *pGlu-His-Trp-Ser-Tyr-Phe-Trp-Leu-Pro-Gly-*NH_2 dengan substitusi residu ke-6 dari glisin menjadi fenilalanin (*Phe*^{6}*, GnRH-III*). Hasil uji *in vivo* pada ikan zebra menunjukkan bahwa perlakuan analog *GnRHa* menghasilkan tingkat keberhasilan pemijahan sebesar 36%, lebih tinggi dibandingkan kontrol negatif (20%), tetapi lebih rendah dibandingkan kontrol positif (56%). Perlakuan analog *GnRHa* juga menunjukkan kecenderungan peningkatan ekspresi gen relatif *luteinizing hormone* (*LH*) dan *follicle-stimulating hormone* (*FSH*), meskipun tidak berbeda nyata secara statistik. Hasil penelitian ini menunjukkan bahwa kandidat analog *GnRHa* hasil perancangan *in silico* memiliki potensi biologis untuk menstimulasi pemijahan ikan dan mendukung pemanfaatan pendekatan komputasional dalam pengembangan hormon reproduksi untuk akuakultur.

Kata kunci: *Danio rerio*, *GnRHa*, *molecular docking*, pemijahan, reproduksi ikan.

UNIVERSITAS
GADJAH MADA
**Perancangan Kandidat Analog Agonis Gonadotropin-Releasing Hormone (GnRHa) secara In Silico dan
Pengujian In Vivo pada Ikan Zebra (Danio rerio Hamilton, 1822)**
Rahma Aulia, Dr. Dini Wahyu Kartika Sari, S.Pi., M.Si.; Dr. Ir. Triyanto, M.Si.
Universitas Gadjah Mada, 2026 | Diunduh dari http://etd.repository.ugm.ac.id/

ABSTRACT

In Silico Design of a Gonadotropin-Releasing Hormone Agonist (GnRHa) Analog Candidate and In Vivo Evaluation in Zebrafish (*Danio rerio* Hamilton, 1822)

Hormonal stimulation is widely used to overcome asynchronous gonadal maturation between male and female broodstock in aquaculture species. The dependence on imported synthetic hormones has encouraged the development of alternative gonadotropin-releasing hormone agonist (GnRHa) analogs that can be independently developed. This study aimed to design potential GnRHa analog candidates for stimulating fish spawning through an in silico approach and to evaluate their effectiveness in vivo using zebrafish (*Danio rerio*). Analog design was performed using a molecular docking approach involving 10 gonadotropin-releasing hormone receptor (GnRHR) models from various fish species. A total of 512 GnRHa analog candidates were screened through three selection stages. The selection process resulted in one GnRHa analog candidate selected for synthesis, namely a decapeptide analog with the sequence *pGlu-His-Trp-Ser-Tyr-Phe-Trp-Leu-Pro-Gly-*NH_2, containing a substitution of glycine with phenylalanine at position 6 (*Phe*^{6}, GnRH-III). The in vivo evaluation in zebrafish showed that the GnRHa analog treatment achieved a spawning success rate of 36%, which was higher than the negative control (20%) but lower than the positive control (56%). The GnRHa analog also exhibited a tendency to increase the relative expression of luteinizing hormone (LH) and follicle-stimulating hormone (FSH) genes, although the differences were not statistically significant. These findings indicate that the GnRHa analog designed through the in silico approach possesses biological potential to stimulate fish spawning and supports the application of computational approaches for the development of reproductive hormones in aquaculture.

Keywords: *Danio rerio*, fish reproduction, GnRHa, molecular docking, spawning.