

Evaluation of viability and nutritive value of *Indigofera tinctoria* as a potential animal feeding in Aceh Province, Indonesia

M. Aman Yaman; M. Daud; Zulfan, Yadi Jufri and T. Fadrial Karmil

UPT. University Farm- University of Syiah Kuala, Aceh Province, Indonesia. Email : yamanusk@yahoo.com

Abstract. A series of studies related to animal feeding technology to stimulate the egg production and egg quality with the development of a cheap source of protein types and useful has been done through the evaluation of viability and nutritive value of *Indigofera tinctoria* and in vivo treatments on quail and chicken. Research conducted since 2010 to October 2012 with a focus on increasing the ability to grow the *Indigofera*'s seed under soaking treatment in auxin hormone and testing the nutritional value on quail and chicken. The first study related to the viability testing is done by soaking the seed of *Indigofera* in auxin hormone before planting in the field. The study consisted of 4 treatments and 5 replications of soaking period, namely: control, B (12 hours), C (24 hours) and D (32 hours) in the solution. The parameters measured were: viability and growth of seed and dry matter content of *Indigofera* leaf. The second study tested the nutritive value of *Indigofera* in the ration of laying chickens and quail. Treatments were: 0, 2, 4 and 6% of *Indigofera* leaf in the ration. Parameters observed in were: egg production, fertility, hatchability and egg quality. The results showed that the viability of the *Indigofera*'s seed with soaking treatment significantly increased to 80% and soaking for 32 hours resulted a higher viability. The treatment of soaking in auxin hormone also increased nutrient content of *indigofera* leaf especially protein. In terms of nutritional value, supplement of *Indigofera* leaf was very useful to improve the production and quality of eggs in both local laying chickens and quail. The addition of *Indigofera* leaf in the ration up to 5% also reduced the feed consumption and increased Haugh unit of egg chicken. From these results it was concluded that the viability of *Indigofera tinctoria* increased by soaking in auxin hormone for 12-32 hours. These treatments also stimulated the dry matter and protein contents in *Indigofera*'s leaf. The supplement of *Indigofera tinctoria* leaf as much as 1-5% in the ration also improved the egg production and quality of local chicken and quail. It was indicated that *Indigofera tinctoria* contains not only protein and amino acids but also vitamin and mineral for egg quality.

Keywords: *Indigofera*, quail, chicken, viability, nutrition

Introduction

It is more pronounced in the poultry industry that cost production of rations is very high achieve more than 70% due to the poultry ration contains a high protein requirements. Many attempts were made in an effort to meet the requirement of protein in poultry rations by animal and cereal proteins materials but the condition is not satisfactory because of high price (Yaman, 2010). The major component of poultry and quail diets are vegetable and animal protein sources, which are available in comparatively greater quantity and can be efficiently incorporated in poultry and quail diets. Among vegetable protein sources the soybean meal and fish meal are well known due to their best profile of certain essential amino acids (Cromwell, 1999). The use of soybean meal and fish meal in poultry diets are limited due to its high cost, dependency on import, tariffs and import duties, with no quality assurance and anti-nutritional factors like trypsin inhibitors and presence of complex polysaccharides (Swick, 1999). Use of vegetable protein ration combined with other cereal (soybeans, corn, beans and cotton seed) in the ration of laying chicken will provide many benefits among others to increase the number and quality of eggs as well as serve as a source of vitamins and minerals that can improve the health of poultry. These reasons led nutritionists to search for some alternate good sources of vegetable proteins.

Among vegetable protein meals for animal, legume stands second and one of them is *Indigofera tinctoria*. From previous study it was well known that *indigofera tinctoria* is a type of legume that contains crude protein and energy is high enough and commonly used to feed ruminants especially goats, sheep and cattle (Tarigan dan Ginting, 2011). Use *indigofera tinctoria* poultry rations as a protein source can be possible if accompanied by processing and accurately formulated with other ration ingredients. Use *indigofera tinctoria* in the ration of local chickens and quail laying is expected to be an alternative source of cheap protein that has added value for increasing the egg production and egg quality. The *Indigofera tinctoria* is available at low price and being used in a limited quantity in poultry feed, but the inclusion level of *Indigofera tinctoria* can be increased to reduce the cost of production of the feed.

However, the main problem of *Indigofera tinctoria* is a low viability during seedling. This is the limiting factor to grow *Indigofera tinctoria* in field and affect the nutritive value as a potential protein source for poultry. The present research is designed to evaluate the viability of *Indigofera tinctoria* during seedling period by soaking in auxin hormone. In view in animal nutrition, the present research also investigate various levels of *Indigofera tinctoria* and their impact on egg production, fertility, hatchability and haugh unit of quail and local laying chicken.

Materials and Methods

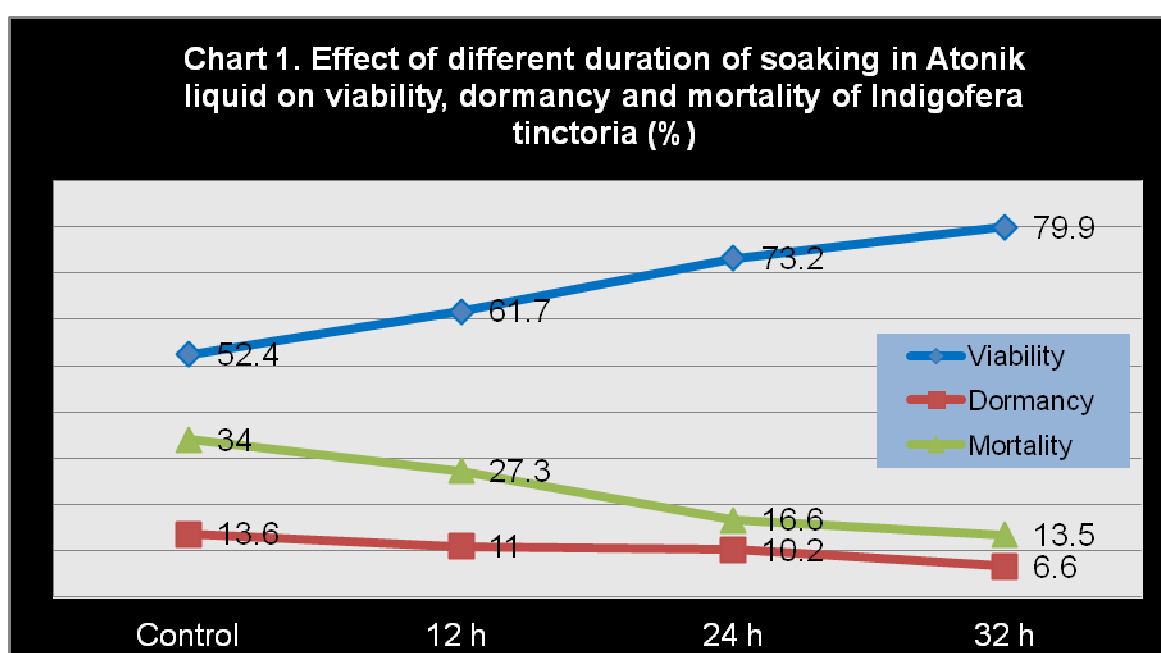
The first study using *Indigofera tinctoria* seeds that have been selected, Auxin and soil media without the use of organic and chemical fertilizers. Before planting in polybags, *Indigofera tinctoria* seeds soaked with auxin hormone and treatment were the control treatment (without soaking), B (12 hours), C (24 hours) and D (32 hours) of soaking. Furthermore, the control seeds, B (12 hours), C (24 hours) and D (32 hours) were planted in the planting medium in poly bags and observed the seed viability for 8 weeks and then transferred to the field for 4 months. The leaves harvested for proximate analysis to determine level of nutrients content. In the second study, the treatment of supplementation of *Indigofera tinctoria* in quail and chicken ration were 2, 4 and 6%. Parameters were egg production and egg quality. All data obtained were analyzed using analysis of variance test (Steel and Torrie, 1995).

Results and Discussion

Viability and content of Nutrition

The result of first study showed that soaking treatment of seed by auxin hormones significantly ($P < 0.01$) increased the viability and leaf nutrient content of *Indigofera tinctoria*. The viability of *Indigofera tinctoria* during seedling increased more than 25% after soaking with auxin hormone for 32 hours. Soaking in auxine hormone from 12 to 32 hours also caused a decrease in the percentage of seed dormancy and mortality of *Indigofera tinctoria* (Chart 1).

From this study it was known that the low viability of *Indigofera tinctoria* during seedling which has been very difficult to grow due to the perishable nature of the seed can be overcome by soaking in auxin hormone. The soaking treatment also affected its viability to grow due to the absorption of auxin hormone into seed fiber depend on soaking duration. Treatment of soaking in auxin hormone also stimulated the growing speed of *Indigofera tinctoria* in field. These conditions support the production of leaves during the growth process and lead to nutritional quality of the leaves increased particularly dry matter content and protein content of *Indigofera tinctoria* (Table 1.)



Egg production, Fertility and Hatchability

In the second study the effect of supplementation of *Indigofera* leaf in quail ration showed significantly increased in production, fertility and hatchability of quail and chicken eggs in line with the increase in the percentage of the percentage *Indigofera* in the ration. In addition, supplement of 2-6% *Indigofera* leaf in the ration increased the egg production by 5% and 7% of fertility and 10% of hatchability for egg quail (Table 2). The supplement of 2-6% *Indigofera* leaf also increased egg production, fertility and hatchability of local chicken. It was also detected that supplement of 2-6% *Indigofera* leaf increased the haugh unit of egg chicken.

This phenomenon showed that *Indigofera tinctoria* contained not only protein and amino acids to increased fertility and hatchability but it was also important to supply vitamins and minerals in ration. This also indicated that combination of *Indigofera* and other materials in poultry ration can meet the nutritional requirement in the ration such as protein, amino acids, vitamins (A and E) and minerals (micro and macro minerals) related to the egg quality. In line with the opinion (Gerber, 2010; Hussen *et al.*, 1999) that the ration ingredients formulated by vegetables and cereals rich in amino acids, vitamins and minerals will improve the fertility and hatchability of eggs. Leaf protein is a good source of amino acids, with methionine being a limiting factor and also be rich in polyphenols (Falco *et al.*, 1999).

Table 2. Effect of supplementation of *Indigofera* powder in quail ration on egg production, fertility and hatchability

Parameters	Control (0%)	A (2%)	B (4%)	C (6%)
1. Egg production (%)	61.3 ^a	62.2 ^a	64.7 ^a	67.6 ^b
2. Fertility (%)	67.9 ^a	69.4 ^a	78.3 ^b	84.9 ^b
3. Hatchability (%)	87.7 ^a	88.3 ^a	94.6 ^b	97.5 ^b

Means with different letter differ significantly ($P < 0.01$) in a row

Table 3. Effect of supplementation of Indigofera powder in local layer chicken ration on egg production, fertility, hatchability and Haugh unit

Parameters	Control (0%)	B (2%)	C (4%)	D (6%)
1. Egg production (%)	63.1 ^a	72.7 ^a	76.5 ^a	78.4 ^b
2. Fertility (%)	57.5 ^a	71.5 ^a	84.5 ^b	87.2 ^b
3. Hatchability (%)	73.5 ^a	84.7 ^a	92.2 ^b	95.5 ^b
4. Haugh unit (HU)	63.5 ^a	67.4 ^b	68.9 ^b	72.6 ^c

Means with different letter differ significantly ($P < 0.01$) in a row

Conclusions

The results of this study indicated that for growing of Indigofera as a source of protein on poultry diet required the soaking process using auxin hormone to enhance the growth, production and nutritional value of Indigofera leaf. The use of Indigofera leaf as many as 2-6% in ration increased the production, fertility, hatchability of quail eggs and also increased the Haugh Unit of local chicken egg. These results proved that Indigofera leaf increased the availability of protein and amino acids and it is also able to complement the availability of vitamins and minerals that are useful for the quality of the eggs.

References

- Ahmad, H. A. and Balandier, R. J. 2004. Physiological responses of layers to alternative feeding regiment of calcium source and phosphorous level. *International Journal of Poultry Science*, 3. 100-111.
- Cromwell, G. L. 1999. Soybean meal the "Gold Standard" the farmer's pride, KPPA News Vol. 11 No.20 November 10, 1999.
- Falco, S., Guida, T., Locke, M., Mauvais, J., Saunders, C., Ward T. & Weber, P. 1995. Transgenic canola and soybean seeds with increased lysine. *Bio/Technology*, 13: 577-582.
- Gerber, N. 2010. Factor effecting egg quality in the commercial laying hen. Egg producers Federation of New Zealand. Auckland.
- Laila Hussein, Mohamed M. El-Fouly, F.K. El-Baz, S.A. Ghanem (1999). "Nutritional quality and the presence of anti-nutritional factors in leaf protein concentrates (LPC)". *International Journal of Food Sciences and Nutrition* 50 (5): 333-343.
- Swick, R. A. 1999. Anti Nutritional Factors. Technical Bulletin American Soybean Association, Singapore. p. 2-3.
- Tarigan, A and Ginting, S. P. 2011. The effect of Indigofera sp and Brachiaria ruziziensis feeding on feed consumption and digestibility of goat. Loka Penelitian Kambing Potong PO Box 1, Galang 20855, Sumatera Utara
- Yaman, M. A. 2010. Superior local Chicken. PT. Penebar Swadaya. Jakarta.