

# CONTENTS

Page

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*ack 13*  
**ACKNOWLEDGEMENT**

<b>I- INTRODUCTION</b>	1
<b>II- REVIEW OF LITERATURE</b>	4
2.1- Sources of protein	4
2.2- Plant protein sources	6
2.2.1- Soybean meal	7
2.2.2- Rapeseed meal	10
2.2.3- Cottonseed meal	14
2.2.4- Linseed meal	17
2.2.5- Sunflower meal	17
2.3- Protein quality of diet	18
2.3.1- Biological value of protein	18
2.4- Digestibility	21
2.5- Carcass composition	24
2.6- Economics	24
<b>III- MATERIALS AND METHODS</b>	26
3.1- Experimental diets	26
3.1.1- Diet preparation	28
3.2- The experimental fish	28
3.3- The experimental design	30
3.4- Digestion trials	30
3.5- Chemical analysis	31
3.5.1- Fish sampling for analysis	31
3.6- The energy value of feed and fish	31
3.7- Data collection	32
3.7.1- Growth study	32
3.7.2- Dietary utilization of protein	33
3.7.3- Feed performance	33
3.7.4- Carcass composition	34
3.7.5- Digestibility study	34
3.8- Nutrition economics	34
3.9- Statistical analysis	35
<b>IV- RESULTS AND DISCUSSION</b>	36
4.1- Proximate analysis of <sup>the</sup> experimental diets	36
4.2- Apparent feed digestibility	36
4.3- Growth performance of fish fed <sup>the</sup> experimental diets	41
4.3.1- Final body weight	41
4.3.2- Body weight gain	44
4.3.3- Growth rate	46
4.3.4- Specific growth rate (SGR)	49

	<b>Page</b>
4.3.5- Condition factor (CF) _____	49
4.4- Feed performance of fish fed experimental diets _____	49
4.4.1- Feed conversion ratio (FCR) _____	49
4.4.2- Protein efficiency ratio (PER) _____	54
4.4.3- Protein productive value (PPV) _____	57
4.4.4- Energy retention value (ERV) _____	57
<del>4.5- Nutrient utilization parameters _____</del>	<del>60</del>
<del>4.6- The use of plant protein in diet _____</del>	<del>62</del>
4.5 <del>4.5</del> Carcass composition of fresh fish flesh _____	63
4.6 <del>4.6</del> Economical analysis _____	67
4.7 <del>4.7</del> Feeding level 5% _____	68
4.9.1- Growth performance _____	68
4.9.2- Feed performance and condition factor _____	73
<b>V- SUMMARY</b> <i>and Conclusion</i> _____	77
<b>VI- REFERENCES</b> _____	99
<b>VII- ARABIC SUMMARY</b>	

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This experiment was conducted in Fish Lab. in Fac. of Agric. Cairo Univ. during 1995. It was conducted to study the effect of different plant protein sources on performance of Nile tilapia.

### SUMMARY AND CONCLUSION

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The experiment <sup>was</sup> based on the partial replacement of soy protein by plant proteins from the rapeseed, sunflower, cottonseed and linseed meals at a replacement level of 25% and 50% of the soy protein. Using these <sup>experimental</sup> test diets, growth and feed performances and digestibility trials were tested on the experimental fish (Nile tilapia).

The results obtained in this work could be summarized as follows:

1- Generally the apparent protein digestibility (APD) values for all tested diets by Tilapia nilotica were high. Apparent protein digestibility coefficient of the control diet (91.42%) was significantly higher ( $P < 0.01$ ) than that of all other tested diets. The sunflower diet had better protein digestibility (87.46%) than that of the cottonseed diet (85.77%). Both the linseed diet and the rapeseed diet had also good protein digestibility coefficients, with an average of 87.09% and 86.88% respectively. Increasing the level of partial replacement of the sunflower, cottonseed and linseed protein resulted in a minor decrease in protein digestibility (less than 1.6%). The high protein digestibility for all test diets obtained in the present study indicates that protein digestibility was not limited by protein source.

2- The best growth response was achieved with the rapeseed (25%) and the control diets, which was significantly ( $P < 0.01$ ) higher than values obtained for fish fed the sunflower, cottonseed and linseed diets. The sunflower diet had slightly better growth performance than the cottonseed diet. Growth performance expressed as body values obtained for fish fed on linseed diets were significantly ( $P < 0.01$ ) poorer than values obtained for fish fed on all other diets. Increasing the level of linseed incorporation in the formulated diet resulted in a drastic decrease in body gain.

3- Fish fed the control soybean diet showed the best growth rate (11%) similar to fish fed with the rapeseed diet (11.5%). The results of the fish growth <sup>showed</sup> seem to prove that the linseed meal can not be considered as satisfactory protein source for juvenila Tilapia nilotica. Fish fed sunflower diet showed a slightly higher rate of growth (9.96-10.59%) than fish fed cottonseed diet (9.55-9.62%). Increasing the level of both sunflower and cottonseed protein in the formulated diets, resulted in a decrease in growth rate, by a marginal value.

4- Fish fed the control diet showed the best feed conversion ratio (2.66:1), and was nearly identical to that of the rapeseed diet (25%). In the present study, fish fed experimental diets containing sunflower (25%), sunflower (50%), cottonseed (25%) and cottonseed (50%) produced almost the same feed conversion ratio which ranged from 3.01-3.25:1. The control and the rapeseed diets had the best FCR compared to all experimental diets. The linseed diet yielded the poorest feed conversion ratio compared to all test diets. According to the feed conversion ratio, the soy protein and the rapeseed protein (25%) seemed to be better protein sources compared to all other sources of plant proteins, however, the improvement in FCR (2.66) of those two protein sources was only 16% higher than that of sunflower and cottonseed diets.

~~Our results showed that~~ <sup>It</sup> is possible to incorporate large amounts of the sunflower and cottonseed protein (Up to 50%) as partial replacement to soy protein in diets for growing fish without a high deterioration in FCR. The findings of this study suggest that the quality of protein in rapeseed is excellent for Tilapia nilotica at the 25% inculsion level.

5- In spite of equal protein levels in all experimental diets, the quality of different protein sources varied significantly. Nile tilapia fed the control and rapeseed (25%) diets had significantly high protein efficiency ratio (PER), of 1.26, than fish fed the sunflower (1.09-1.15) and the cottonseed (1.10-1.11) diets. The poorest protein efficiency ratio was obtained by fish fed the linseed diets (0.58-0.85). Increasing the level of linseed inclusion in the diet yielded the lowest PER value (0.58) in comparison to all other sources of plant protein.

6- Although juvenile tilapia fed soy and rapeseed (25%) diets showed a similar PER of 1.26, the PPV value of the rapeseed diet (23.0) was statistically higher than that of the control diet (21.83). Increasing the level of sunflower or cottonseed protein in the test diets resulted in a slight decrease in the PPV value. The protein productive value for the linseed (25%) and the linseed (50%) diets average 13.69 and 9.65 respectively.

7- The rapeseed (25%) and the control diets were different in the energy retention value. The rapeseed diet (25%) had the best ERV value (17.26) statistically higher than that obtained by fish fed on the control diet (15.41) ( $P < 0.01$ ). The sunflower diet had a better ERV (15.30-15.57) than that of the cottonseed diets (12.52-13.22). This leads to the conclusion that the energy retention value for the sunflower and the soybean diets was better than that of the cottonseed diets. The energy retention value was poorest for the linseed diets, decreasing from 9.55 at 25% to 6.92 at 50%.

8- The protein content of fish fed the control, sunflower (25%), cottonseed (25%) and rapeseed (25%) diets was statistically similar and ranged 17.41-18.32%. Increasing the level of sunflower and cottonseed protein in the formulated diet resulted in a slight decrease in the protein content of fish muscles (Less than 1%). The fish fed the linseed diet had relatively a low protein content (16.28-17.0%) compared to those groups fed all other diets. Fat content of fish fed the rapeseed diet (25%) was higher (5.07%) compared to fish fed all other diets.

9- The energetic content of fish flesh showed the highest content in muscles of fish fed rapeseed diet (25%), approximately 1.53 Kcal/g. The sunflower diet (25%) showed the next highest energetic value (1.42 Kcal/g) in fish muscles. Tilapia fed the control and the sunflower (50%) diets had the same energetic value fish muscles (1.34 Kcal/g) which was superior to the results of the linseed treatment.

The results of this study showed that there are good possibilities of partial substitution of soybean protein with protein contained in the sunflower and cottonseed meal in feed mixtures for Tilapia nilotica, up to 50% of the soy protein, without adversely affecting growth performance or protein utilization.

All nutrient utilization parameters (PER, PPV, ERV, FCR) revealed that fish fed diets containing the control or the rapeseed diets (25%) performed significantly ( $P < 0.01$ ) better than those fed the sunflower (25, 50%) or the cottonseed (25, 50%) diets. The sunflower diets were utilized efficiently than the cottonseed diets, however, the difference between these two sources of protein in protein utilization was small. The decrease in protein efficiency of the linseed diets could be accounted for by the high presence of anti-nutritional factors than that of all other tested plant protein

sources. In this study, it has been established that the linseed protein was inferior in nutritional quality to all tested plant proteins. [To reduce production costs, the replacement of expensive soy protein with less expensive rapeseed, sunflower and cottonseed proteins is recommended, as long as satisfactory growth and feed efficiency can be maintained.]

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16- The cost of feed for producing one kilogram of fish varied according to the experimental diet. The rapeseed diet (25%) was the most efficient diet in terms of economical analysis. Feed costs averaged 2.752 LE/Kg fish followed by the control diet which averaged 3.225 LE/Kg fish. The sunflower diets was superior to the cottonseed diets in terms of economically efficiency. The feed costs for producing one kilogram of fish averaged 3.27 and 3.311 LE/Kg fish for the sunflower diet (25%) and (50%) respectively. While that of the cottonseed diet (25%) and (50%) was 3.338 and 3.689 LE/Kg respectively. The linseed diet (50%) was the most expensive in terms of feed costs per kilogram of fish (6.088 LE/Kg).

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11- When Nile tilapia were fed on all experimental diets at a feeding level equivalent to 5% of body weight daily, the feed conversion ratio deteriorated to a value of 4.78 -7.06:1 with an overall value of 5.2:1. The overall feed and growth performances of the experiment at the 5% feeding level was not economical due to over-feeding and wastage of food.

One can conclude that following:

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