

Wealth from Waste: Mustard cake solution as Organic foliar nutrient

Kumari Sushma Mahto

Abstract: -

*With the rising demand for sustainable agriculture, the use of agricultural by-products as environmentally-friendly substitutes for synthetic fertilizers has become of growing interest. The solid residue after extraction of oil from mustard (*Brassica juncea* L.) seeds is called mustard cake which is rich in nutrients and used traditionally as organic manure and animal feed. Its use as an organic foliar nutrient however is a novel method for value addition. This liquid extract made from mustard cake has soluble macro- and micronutrients, amino acids, organic compounds and bioactive substances which are easily absorbed by plant leaves. The foliar application provides rapid nutrient uptake, nutrient use efficiency and can increase stress resistance, growth, yield and efficiency. Using mustard cake solution as a foliar spray is an example of the concept of "Wealth from Waste", where an agricultural by-product is put to a beneficial use as a crop input.*

Keywords: Mustard cake, Foliar nutrition, Organic nutrition, Waste valorization, Sustainable agriculture etc.

1. Introduction:

Mustard cake is the solid residue (by-product) known as ‘*Sarson Khalli*’ is about 60 percent of the seed weight, remains after the oil extraction from mustard (*Brassica juncea* L.) seeds from the mustard oil industry (Swati and Das, 2015). Modern agriculture system has to deal with various challenges such as degradation of soil fertility, high dependence

on chemical fertilizer use, pollution of the environment, and the rise in agricultural production cost. Organic agriculture is a sustainable approach that prioritizes the use of locally and/or naturally available resources, renewables and natural nutrient sources, and thus aims to minimize synthetic fertilizers and to produce crops in an environmentally

Kumari Sushma Mahto

*Ph.D. Research Scholar, Department of Plantation Crops and Processing,
Uttar Banga Krishi Viswavidyalaya, Pundibari, West Bengal-736165*

responsible way (Rajasri et al., 2025). Wealth from waste: Using of the by- product to economically valuable product without discarding them. This strategy emphasizes recycling of the waste products from agriculture, better use efficiency of nutrients, sustainable agriculture, principles of the circular economy and reduction of environmental pollution (Duque-Acevedo et al., 2020). Sustainable nutrient management have thus become a global priority and are essential to maintain soil fertility and healthy plant growth. The concept of “Wealth from waste” is demonstrated by transforming an underutilized by product mustard cake into mustard cake solution as a foliar spray, a nutrient rich liquid fertilizer. Mustard oil cake water (solution) is a highly used liquid organic manure in West Bengal and Bangladesh, which is commonly used as foliar spray to stimulate plant growth of crops (Hassan, 2017). Foliar feeding is providing essential nutrients to a plant through the foliar

application of a liquid fertilizer solution. These nutrients are absorbed by the plants through leaves by stomata and epidermis found in the surface of the leaves (Patil and Chetan, 2018).

2. Nutritional composition of mustard cake

Table No. 1. (Swati and Das, 2015)

3. Preparation and Application of Mustard cake solution:

For the preparation of Mustard cake solution, only ingredients such as mustard cake and water are required. Mustard cake (1 kg) and water (10 litres) are mixed in a ratio of 1:10 in a clean container. Stir the mixture and cover the container loosely to allow gas exchange. Keep it for 5-7 days for proper fermentation meanwhile stir the mixture once or twice daily for uniform fermentation. After that the solution is filtered using fine sieve or muslin cloth.

Application Method:

- ☞ Filtrate is diluted to 3 to 5% concentration before application as foliar spray.
- ☞ After that the mustard cake water should be sprayed to the crop field because fresh solution is recommended for effective results (Hassan, 2017).
- ☞ Apply during early morning or late evening for best results.

Precautions and Limitations

- ☞ To prevent leaf burn, avoid high concentrations.

Table No. 1. Nutritional composition of mustard cake. (Swati and Das, 2015)

Component	Content
Nitrogen	4.8%
Phosphorus	2%
Potassium	1.3%
Carbohydrate	21%
Lipid	21%
Crude fibre	8.5%
Ash content	8%

- ☞ Always use a correct filter to prevent blockage of spray equipment.
- ☞ Test on a small scale before going to large scale.
- ☞ Proper fermentation should be ensured to prevent any contamination.

- ☞ Supplies quick nourishment during critical growth stages like flowering and fruiting.

5. Benefits of Mustard Cake Solution as Foliar Nutrition



4. Mechanism of Foliar Nutrition

Foliar feeding efficiently provides additional nutrient and stimulates plant metabolism by applying directly onto plant leaves that gives major nutrients, hormones and beneficial substances and absorbed through stomata and cuticles. Nutrients taken up by the foliage of plants can be just as effective and sometimes more than soil applications, with very little quantity of nutrients as compared to soil applications (Niu et al., 2021).

Foliar nutrition ensures:

- ☞ Rapid nutrient uptake
- ☞ immediate response on nutrient deficiency
- ☞ Reduced nutrient loss as compared to soil treatments

5.1.Rapid Nutrient Uptake and Quick Response

Essential nutrients can be directly absorbed by leaves in foliar feeding method, which results in quicker responses in plants than soil feeding. This is especially advantageous when soil nutrient levels are low and during the stress condition (Shahrajabian et al., 2022).

5.2.Enhanced Growth and Yield

A number of studies have demonstrated significant growth and yield improvements. In tomato, foliar application of mustard oil cake leachate boosted the growth, fruit yield and fruit quality to a significant level (Ali et al., 2014).

5.3.Organic and Sustainable Alternative

Mustard cake solution is prepared from a completely natural byproduct and hence it is environmentally safe and is compatible with the principle of organic farming (Ghosh and Das, 2025). It helps to minimize the use of synthetic fertilisers, thereby lowering input cost and environmental effects and also boosting the growth of plants naturally.

5.4. Natural Pest and Disease management

Mustard cake is rich in the compound such as glucosinolates which are able to break down into compounds with mild pesticidal and antifungal properties as a natural way of protecting crops (Abedini et al., 2023).

6. Conclusion

Mustard cake solution is not only cost effective and environmentally friendly but it is also a sustainable source of organic foliar nutrition, due to its rich nutrient content and the quick nutrient absorption of foliar application. Its application can promote plant growth, improve productivity and resilience of crops, maintain soil health, and reduce reliance on synthetic fertilizers and chemical inputs. As the agricultural industry increasingly focuses on sustainable and resource-efficient farming methods, the use of mustard cake solution in agricultural production could help to improve the health of crops and farming systems. It is thus a good example of “Wealth from Waste” and a potential pathway to sustainable agriculture development.

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