SSRG International Journal of Economics and Management Studies
ISSN: 2393–9125 / https://doi.org/10.14445/23939125/IJEMS-V12I6P106

Volume 12 Issue 6, 61-67, June 2025


*Original Article*

# Investigating Adulteration in Mustard Oil: Stakeholder Perspectives and Policy Challenges in India

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Received: 13 April 2025 Revised: 25 May 2025 Accepted: 08 June 2025 Published: 29 June 2025

***Abstract -*** *Adulteration is the process of mixing cheaper, low-quality oil with pure edible oil. A primary survey indicated the main issues involved in mustard oil adulteration. Addressing this issue requires a concerted effort by all stakeholders at various levels. A primary survey indicated the main issues involved in mustard oil adulteration. Addressing this issue requires a concerted effort by all stakeholders at multiple levels. Adulteration of edible oils is a serious issue that plagues the Indian economy. The problems extend from domestic production to the almost no-tariff import of the product. Due to the ever-increasing demand, adulteration and imports become attractive propositions. The primary reasons for adulteration in edible oil are a cheaper production cost, and increasing domestic production of edible oil seeds has also positively correlated with edible oil production in India. The lack of self-sufficiency since the 1900s shows a lack of progression, and so the continued long-driven slow growth in this area. The three main oils that are used for adulteration are palm oil, vanaspati oil, and argemone oil. The harmful effects of adulteration, as seen by the dropsy case, have also been highlighted, which shows a negative impact that adulteration may have on human health. A primary survey indicated the main issues involved in mustard oil adulteration. Addressing this issue requires a concerted effort by all stakeholders at various levels, including retailers, suppliers of oilseed, and farmers from different states of Punjab, Rajasthan, and Bihar.*

***Keywords -*** *Adulteration, Dropsy Effect, FSSAI, Mustard Oil, Oilseed Production.*

## 1. Introduction

During the year 2023-2024, India contributed 5-6% of the world oil oilseed production. The country exported oil meals, oil seeds, and minor oils valued at ₹29,587 crore, but the import for the same period was ₹69331.96 crore [1]. This is a dilemma that needs to be urgently addressed. Despite such a widespread market, India faces a significant challenge in meeting the demand for edible oil. The exponentially increasing demand for domestic oilseeds such as mustard, soybean, and sunflower leads to a widening gap between demand and supply [2]. Non-price factors such as unpredictable weather conditions, limited land for cultivation, and fluctuations in prices in the global market lead to a further shortage in supply. [3] Several government organisations have been working to address this issue, like the National Mission on Edible Oil and Oilseeds (NMEO-NP). They offer subsidies to cut down the average cost of production and adopt better farming practices. This plays a dual role by:

1. Making the nation self-sufficient
2. Reducing dependence on the global market and thus declining imports of edible oil.

As seen in Figure 1, the domestic production of edible oils and oil seeds was consistently higher from 2012 to 2023, but the domestic availability was consistently significantly lower. Furthermore, the edible oil market is shifting primarily towards healthier and disease-free oils. Health-conscious consumers influence the market to adopt oils with greater health benefits, such as rice bran oil or sesame oil. This new shift has further complicated the market and added additional twists, as the market is already trying to accomplish the goal of self-sufficiency while simultaneously balancing changing consumer demands along with traditional demands. The edible oil industry in India is at a critical point where there is a potential for huge economic growth through optimum production, at the same time considering diverse consumer preferences.

The shortage of supply and the increased cost of production have led to adulteration of edible oils. In India, in 2023, the FSSAI (Food Safety and Standards Authority of India) disclosed that 24%**[5]** of the edible oil sold in the market was adulterated and unfit for human consumption. The most commonly affected oils are mustard, olive, ghee, coconut, and refined sunflower oil. The reason that adulteration takes place is primarily to reduce costs.**[6]** These adulterants, when added to pure oils, increase their consumption due to lower prices (as the Indian market is price-

driven), while at the same time increasing the profit margin of sellers. Adulteration takes place at 2 levels - at the manufacturing level and at the wholesale level.[7] The adulterants that are used blend uniformly and do not leave any residue.

Research has indicated that there is a widespread adulteration of edible oils, especially in mustard oil and ghee. [8] The detection techniques applied are: nitric acid test (to detect mixing of pure mustard oil with argemone oil). Adulterants like raw cottonseed oil, mineral oils and palm oil are extremely harmful for human consumption. In the case of ghee (clarified butter), the adulterants are potato starch, vanaspati oil, palm oil, and coal tar dye. The above practice needs to be urgently addressed.[8]

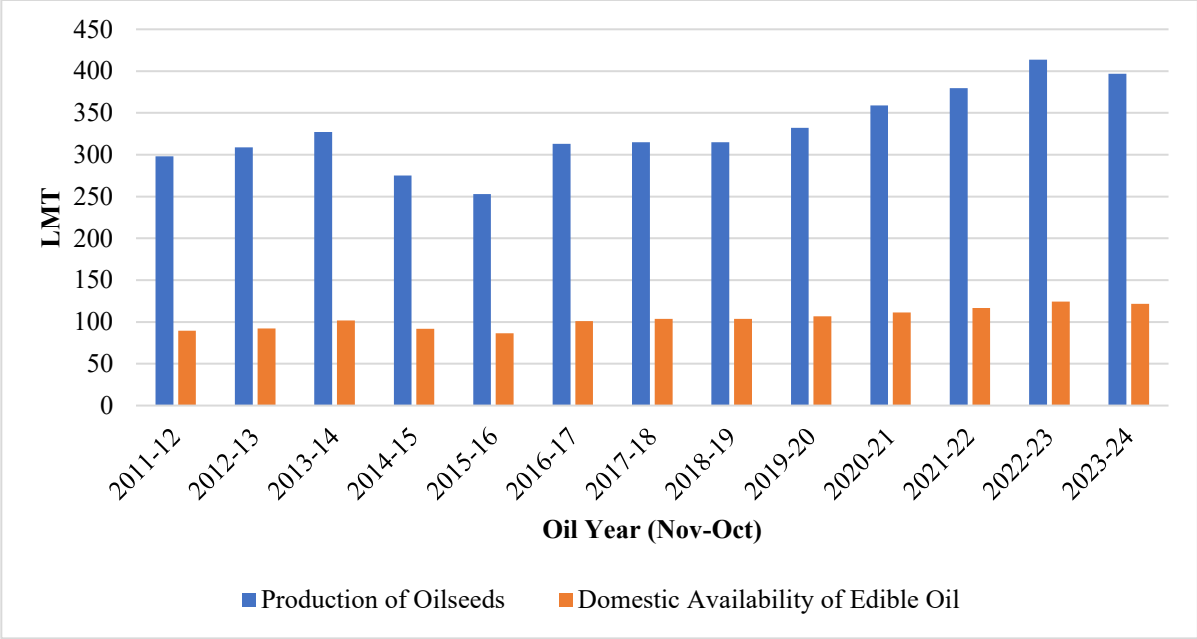


**Fig. 1 Oilseeds Production and Domestic Availability of Edible Oils in India [4]**

## 2. Theoretical Background

This section provides a comprehensive overview of the status of oilseed production in India, the challenges that hinder self-sufficiency in edible oil, and the issue of adulteration in mustard oil. It also highlights the critical role of Rajasthan in mustard production and the implications of policy and market dynamics on this sector.

### *2.1. Oilseed Production in India*

India produced 413.55 lakh metric tonnes (LMT) of oilseeds in 2022–23, largely attributed to favourable climatic conditions and concerted efforts by the government.**[9]** Initiatives such as the National Food Security Mission (NFSM), Targeting Rice Fallow Areas (TRFA), Seed Hubs, Mini-Kit Programmes, and cluster demonstrations of improved technology have supported this growth. Special focus programmes on rapeseed and mustard have also been implemented to boost productivity. Despite these efforts, India remains heavily dependent on imports to meet its domestic edible oil demand [2].

Oilseeds face stiff competition for acreage, particularly from wheat. In the agricultural year 2024–25, the area under oilseed cultivation decreased from 102 lakh hectares in 2023–24 to 98 lakh hectares—a 4% decline—while wheat acreage increased by 2.8%. [10]. This shift is primarily due to the relatively higher and more secure returns offered by wheat, [10] backed by strong price signals and Minimum Support Price (MSP) enforcement. In contrast, oilseed farmers often sell their produce below MSP due to inadequate procurement mechanisms and a lack of government intervention. Additionally, the short shelf life of oilseeds compared to grains such as wheat contributes to distress sales. [10] These market failures undermine farmer confidence and disincentivize oilseed cultivation, despite improvements in yield per hectare.

### *2.2. Importance of Rajasthan in Mustard Oil Production*

Rajasthan plays a pivotal role in India's mustard cultivation, contributing 40–50% of the total rapeseed-mustard output.**[11]** The agro-climatic conditions of the state—characterized by a sowing period from mid-October to early November and optimal germination temperatures around 28°C—are well-suited for mustard cultivation. The state government has introduced measures such as enhanced irrigation facilities, pest and disease management guidance, and real-time weather updates to support mustard farmers.

However, in recent years, the area under mustard cultivation has declined as farmers increasingly diversify into wheat and potatoes, which offer greater resilience to heat stress and better financial returns.[12] Moreover, climatic volatility—including unseasonal heat, droughts, fog, and frost—has affected germination and yield. These environmental stressors, compounded by market and policy challenges, have constrained mustard output despite its critical role in India's edible oil ecosystem.

### *2.3. Historical and Structural Reasons for Lack of Self-Sufficiency*

India was largely self-sufficient in edible oil until the 1970s, with self-reliance levels near 95%. However, a series of shocks—including the 1971 war, the 1972 drought, and population growth—triggered a drop in per capita oil availability from 5 litres in 1971 to 3.9 litres in 1973. This led to an increased reliance on vanaspati (hydrogenated oil), which gradually replaced edible oil in household consumption. [13]

Liberalization of edible oil imports in 1977 further eroded domestic production. By 1980, self-reliance had dropped to 70%. To revive the sector, the government launched the "Operation Golden Flow" under the National Dairy Development Board (NDDB) in 1988, introducing the "Dhara" brand. This initiative achieved considerable success, with Dhara capturing nearly 50% of the organized edible oil market by 1992. [14]

Despite temporary gains, structural issues persisted. The Technology Mission on Oilseeds (1986) expanded cultivation from 15–18 million hectares to 25 million hectares by 1991. However, the 1994 WTO agreement allowed imports under the Open General License (OGL) with reduced duties.

Cheaper imported oils—primarily palm, soy, and sunflower oils—began to dominate the market. By 1998, imports accounted for 30% of India's edible oil requirement, undermining domestic cultivation efforts. Bilateral agreements and reduced import duties further aggravated this trend.**[13]**

### *2.4. Impact of Adulteration and the "Dropsy" Case*

A pivotal moment in mustard oil consumption was the 1998 outbreak of epidemic dropsy in Delhi, which caused over 65 deaths and thousands of illnesses [15] due to the consumption of mustard oil adulterated with Argemone oil.

This incident led to a sharp decline in consumer confidence and a subsequent shift in preference towards imported, refined oils. Consequently, the area under mustard cultivation fell from 7.04 million hectares in 1997–98 to 4.5 million hectares by 2003–04, while edible oil imports surged from 2 million tonnes to over 5 million tonnes during the same period. [16]

### *2.5. Adulteration in Mustard Oil: Types and Motivations*

The three common adulterants in mustard oil are:

1. Palm Oil: Alters the natural golden-yellow color of mustard oil to a lighter shade, misleading consumers into perceiving it as a superior refined product. It also affects the taste and consistency, diluting the health benefits of natural mustard oil.
2. Vanaspati Oil: Impacts the chemical and sensory profile, giving the oil a greasy texture and waxy aftertaste. Vanaspati solidifies at low temperatures, further differentiating it from pure mustard oil.
3. Argemone Oil: The most harmful adulterant, it gives the oil a dull reddish hue and imparts a bitter taste. It contains toxic alkaloids that can cause epidemic dropsy, leading to severe health complications and even death.[17]

Adulteration in mustard oil is driven by both economic incentives and regulatory gaps. The availability of cheaper imported oils—especially palm oil—has made it profitable for unscrupulous players to dilute mustard oil to maximize margins. The 1994 WTO agreement, by reducing import duties and liberalizing trade, accelerated the influx of low-cost oils. This undercut domestic producers and encouraged adulteration, especially in unregulated markets.

Moreover, policy inconsistencies—such as assured MSP and procurement for wheat but not for mustard—have led farmers to shift cultivation towards more remunerative and less volatile crops, exacerbating the edible oil deficit. This can be seen in the following graph.

## 3. Methodology

This study aims to understand and identify the reasons behind adulteration in edible oils, in the geographical context of North India, going beyond just cost-related factors. It seeks to understand the specific causes of adulteration in mustard oil and examine whether this malpractice originates at the manufacturing stage or further down the supply chain, such as at the wholesale or retail level. The research also aims to assess the effectiveness of existing government regulations, the extent to which these rules are enforced, and the penalties imposed on offenders. To gain deeper insights and public perspectives, the study has conducted an online survey focused on these issues. A survey methodology was employed to achieve the objectives of the paper and to obtain results.

To understand the impact of adulteration in mustard oil, a primary survey was conducted online among 47 respondents. They were from the Rajasthan, Bihar, and Punjab regions. The Punjab factories were bordering Rajasthan state of Rajasthan. All the factories and brokers to whom this questionnaire was sent have been in the production of mustard oil for a minimum period of 40 years. Their primary source of income is from mustard oil. Some of these industries have been in existence for more than two generations. All of them have witnessed the 'Dropsy Incident'. The questionnaires were sent to the

respondents via mail and followed up by speaking to them on the phone in case of any misinterpretation or lack of clarity.

An analysis of the online survey conducted in Rajasthan and Bihar regions on the type, extent, and reasons for adulteration in mustard and rapeseed oil. The people who were conducted were primarily brokers of oilseed, retailers, and farmers.

The age distribution of the people was as follows:18-30 years: 10%; 31-45 years: 45%; 46-60 years: 35%; Above 60 years: 10%. The participants were 86% male and 14% female. Most of the people surveyed have been active stakeholder in the oilseed sector for more than 25 years, and some have been in the field for more than 2 generations.

## 4. Results

According to the primary survey conducted amongst 47 respondents, the findings that were discovered are as follows: All the respondents indicated that the main reason for adulteration was that the imported oil is cheaper than the domestic produce. And so, to increase the profit margins of the firm, the producers would deliberately increase the price of the oils and, meanwhile, decrease their costs due to the lower quality oils coming at a lower price. This would indicate that, in the long term, the external costs would be greater than the external benefits.

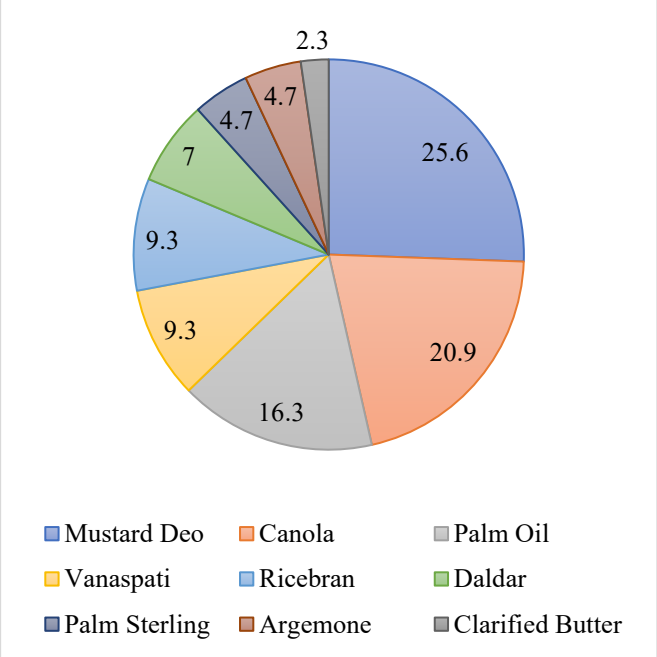


**Fig. 2 Percentage Contribution of Different Oils in Edible Oil Adulteration**

As seen in Figure 2, the main source of adulteration, as indicated by the survey, is: *Canola (20.9 %)* and *Mustard Deo (25.6 %)*

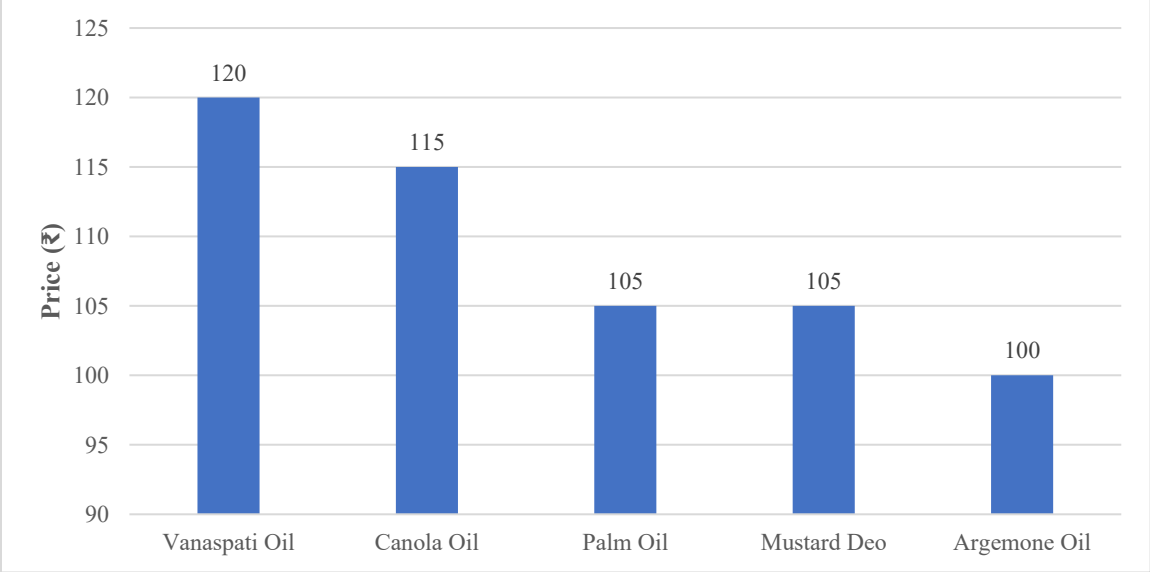


**Fig. 3 Pricing (₹) of Vanaspati, Canola, Palm, Mustard and Argemone oil (All numbers indicate cost(₹)/kg)**

The cost of all the imported adulterants (palm and canola) is cheaper than the pure domestically produced mustard oil. The Indian adulterants (vanaspati and argemone) are lower in price than the pure mustard oil variety (Figure 3).

According to Figure 4, Mustard Deo and Vanaspati have an extremely large impact on the price of oil, with argemone and palm coming a close second. As seen by the graph, the mustard deo and vanaspati impact the price of the edible oil by 26.70% and 23.3%, respectively. The third major contributor is the argemone oil with 20% contribution, and the least contributors are palm and canola oil with 16.70% and 13.30% respectively.

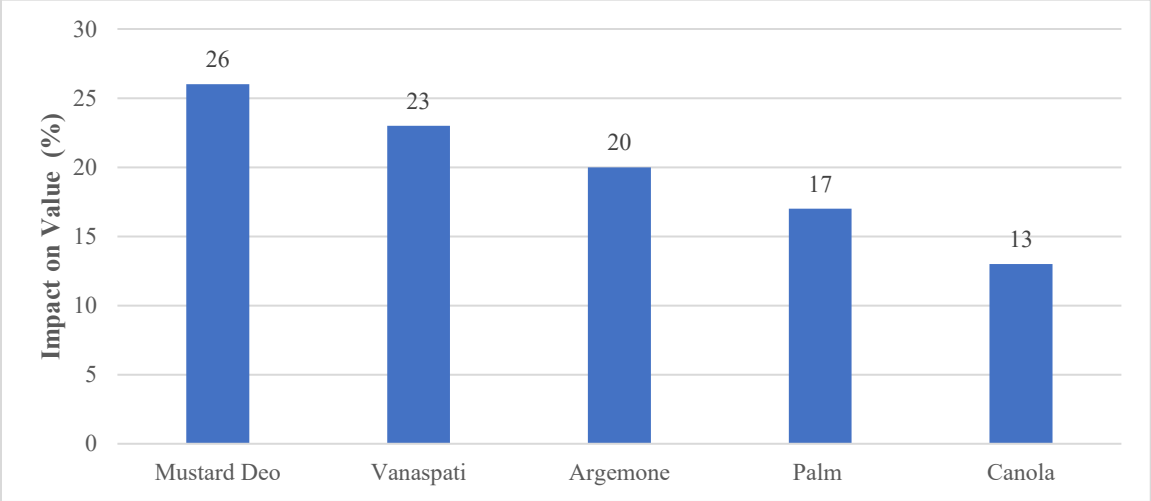


**Fig. 4 Types of Oil and the Impact on the Market**

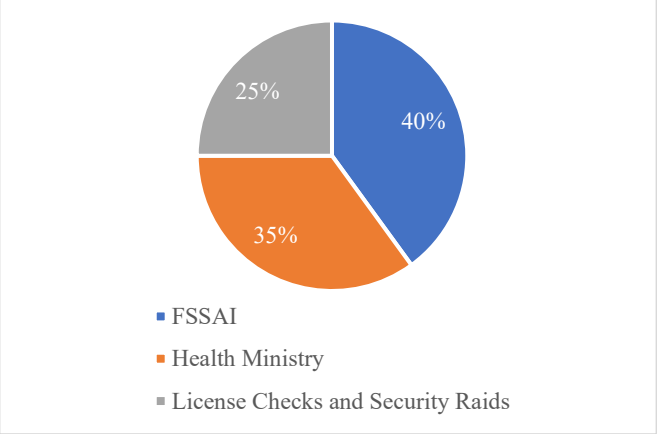


**Fig. 5 Forms of Checks and Balances Done by the Government**

According to the stakeholders surveyed, the two main bodies that are relevant in the context of oil adulteration are FSSAI and the Health Ministry (Figure 5).

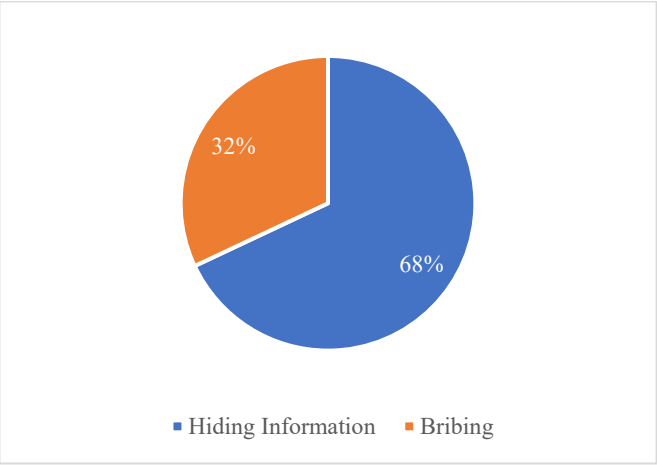


**Fig. 6 Manufacturers' Avoidance of the Checks and Balances**

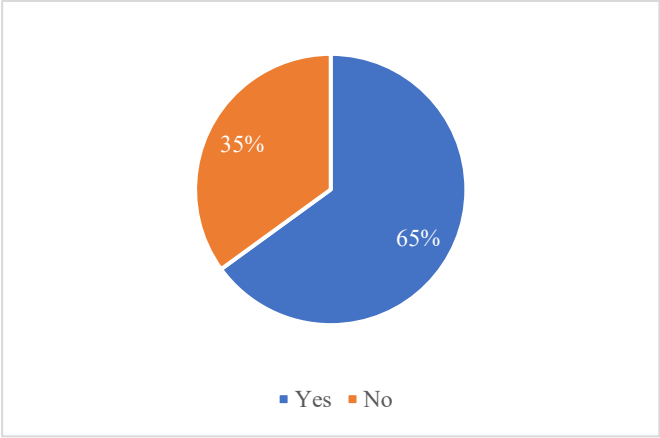


**Fig. 7 Manufacturers Following Rules & Regulations**

The majority of the respondents managed to escape scrutiny by bribing and hiding information (58%), and the balance through hiding information (Figure 6).

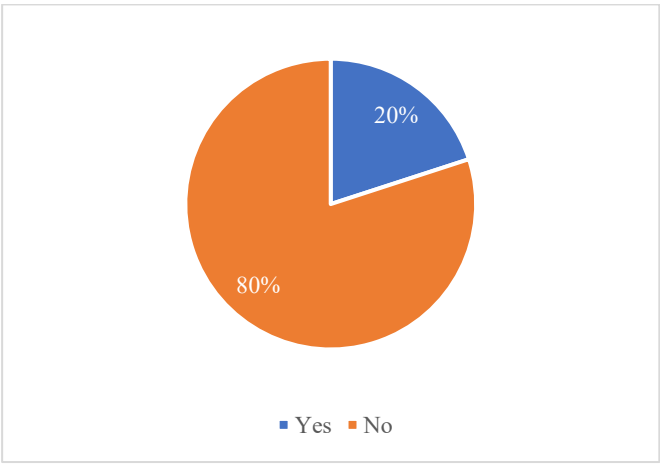


**Fig. 8 Imposition of State Policies**

On paper, almost all the respondents followed all the rules by the government, but their shortcomings were hidden by either understating facts or by bribing.

Most of the respondents indicated that there were no additional instructions imposed on them by the state government. The 47 respondents indicated that the adulterants are imported palmoline, palm sterling, and argemone, respectively. As per the survey, 25 people reported palm olein and palm sterling as the primary imported adulterated products, and the balance 12 indicated argemone as the primary imported adulterant. The government uses the necessary import measures to control the import of this oil.

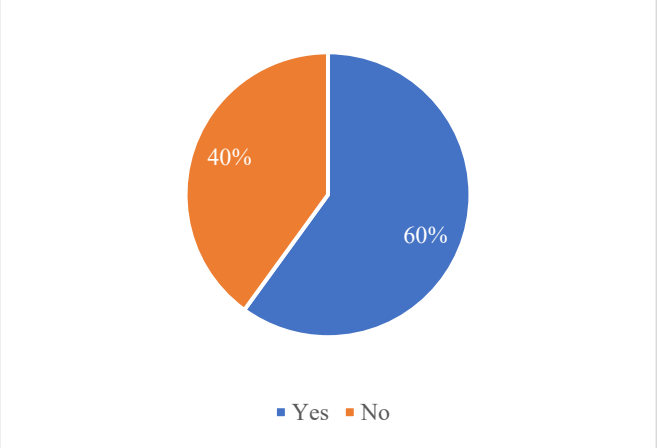


**Fig. 9 Import Rules & Regulations**

As seen in Figure 9, most of the respondents indicated that there were checks and balances to prevent adulteration, but often the adulterers managed to bypass them.

## 5. Discussion

It is quite apparent from the survey conducted that there is a large extent of adulteration that takes place at the sowing, harvesting and in the extraction stage of mustard oil. The survey was not able to measure the levels of adulteration at sowing and harvesting levels; it mainly concentrated on the extraction stage of mustard oil.

The recommendations, according to the survey and the available secondary data, would involve the following: Reduction of erucic acid during sowing and harvesting by using new seeds that have been developed by the Pusa Institute. These are called 'Pusa Mustard-30' (PM30) and 'Pusa Mustard-31'. This was introduced in 2013 and had less than 2% of erucic acid (which is safe for human consumption). These varieties also reduced the time in which the mustard crop matured and simultaneously increased the production per hectare. Attempts should be made to use these seeds by all farmers. More such strains should be developed to increase land under this crop.

The government should implement stringent conditions to implement the FSSAI conditions in letter and spirit. There should be no compromise on safety. Bribe givers and bribe takers should be sternly dealt with. To reduce dependence on unhealthy palm oil imports, the government, both at the centre and at the state, should disperse subsidies and adequately announce MSP for mustard oil to increase production of the crop. The subsidies could be in the form of adequate pricing for the final crop, adequate compensation for fertilisers, adequate compensation for usage of water and electricity, prevent land from shifting from mustard production to wheat production.

## 6. Conclusion

The survey and secondary study indicate rampant adulteration of mustard oil. Besides the measures indicated above, AI, x-ray, fluorescence spectroscopy and biochemical methods should be adopted to prevent adulteration. Import of this oil cannot decrease till the domestic supply meets domestic demand. As edible oil is a necessity any increase in prices would have a detrimental impact on the consumers and the political scenario. Reviving domestic oilseed production on a war footing would address several issues, namely, reduction in imports, reducing the import bill, reducing the deficit on the balance of payment of the country, reduction in unemployment, increase in income, savings, and investment.

Thus, a concerted effort in the manner in which the 'White Revolution' took place would be required in the form of a 'Yellow Revolution' to address all the above-stated issues. This study was limited to the regions of Bihar, Rajasthan, and Punjab. Other areas may have different responses from the survey respondents according to the region-specific behaviour. The future scope could be to have a larger sample size, resulting in a study whose findings could be extrapolated to a greater extent and region. This paper also doesn't take information in a qualitative measure, but rather in a quantitative measure.

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