13

STANDING COMMITTEE ON AGRICULTURE (1994-95)

TENTH LOK SABHA

MINISTRY OF AGRICULTURE (DEPARTMENT OF AGRICULTURE AND COOPERATION)

A REPORT ON KHESARI DAL

THIRTEENTH REPORT

सत्यमेव जयते

LOK SABHA SECRETARIAT
NEW DELHI

February 1995/Magha, 1916 (Saka).

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Presented to Lok Sabha on 14th February, 1995
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LOK SABHA SECRETARIAT
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9. Shri D. Pandian

PREFACE

I, the Chairman of the Standing Committee on Agriculture having been authorised by the Committee to present the report on its behalf present this Thirteenth Report on the subject "A Report on Khesari Dal".

2. The Committee wish to express its thanks to the Ministries of Agriculture (Deptt. of Agriculture & Cooperation), Ministry of Health & Family Welfare, Indian Council of Agricultural Research, National Institute of Nutrition and Academy of Nutrition Improvement for placing before it material and informations in connection with the examination of the subject chosen. The Committee also wish to express their thanks to the representatives of the Ministry of Agriculture (Deptt. of Agriculture & Cooperation), Ministry of Health & Family Welfare, Indian Council of Agricultural Research, National Institute of Nutrition and Academy of Nutrition Improvement who appeared for oral evidence on 12th September, 1994 and placed their considered views before the Committee.

3. The Report was considered and adopted by the Standing Committee on Agriculture on January 11, 1995.

NEW DELHI;
14th *February*, 1995
25th *Magha*, 1916 (*Saka*)

NITISH KUMAR,
Chairman,
Standing Committee on Agriculture.

PART A

INTRODUCTION

Khesari Dal (lathyrus sativus) has been a subject of controversy among the agricultural scientists, nutrition experts and the farming community in the country for many decades. Though, admittedly a high protein pulse, its sale was banned by the Government as early as in 1961, under the Prevention of Food Adulteration Act, 1954, on the ground that its consumption was harmful to health. The controversy arose from the conclusions of certain studies conducted in the past that it contains a toxic element called BOAA (B-N-Oxalyl-aminoalanine) which causes a crippling affliction of the central nervous system called Lathyrism. Though the consumption of Khesari Dal was banned, in the absence of a ban on its cultivation, it continues to be grown in States like Madhya Pradesh, Bihar, West Bengal. It is interesting to note that opinions are sharply divided on whether the consumption of Khesari Dal causes the affliction called lathyrism with one set of nutrition experts vehemently denying that it has any such effect and the other marshalling all facts which they could muster to establish the harmful effect of this Dal. It is equally interesting to note that although the controversy regarding the harmful effect of Khesari Dal is pretty old and even a ban had been imposed on its sale, it can not be said with absolute certainty even now whether the casual relationship between consumption of Khesari Dal and the outbreak of Lathyrism has been conclusively established. This is clear from the fact that despite studies having been conducted by reputed agencies already the Govt. has appointed an independent agency (Industrial Toxicological Research Centre) to undertake again in indepth study of the effects of Khesari Dal which is expected to be completed sometime in 1997. This also points to the importance of this subject which has a bearing on the prosperity of farmers in a certain region, availability of a cheaper source of Protein and above all the health of the people.

It is against this background that the Committee on Agriculture decided to select Khesari Dal for a detailed study with a view to gaining a better understanding of the claims and counter claims regarding the effects of Khesari Dal, of possible methods or techniques or to eliminate or lessen its toxic effect and to exploring ways to put an end to the controversy surrounding Khesari Dal.

The Committee invited opinions and views of people and institutions which have done studies on the subject and also the representatives of

Government of India. They were given ample opportunities to present their views or findings before the Committee. Besides, a lot of written materials on the subject were submitted to the Committee which were carefully examined.

The following chapters deal with the various aspects of this subject and the conclusions and recommendations of the Committee.

CHAPTER I

BACKGROUND

1.1 Khesari Dal (Lathyrus Sativus) is a very hardy leguminous plant which is grown in 'Rabi' season in the State of Madhya Pradesh, Bihar, West Bengal and Maharashtra with the residual moisture, particularly, in the paddy fields. The plant is so hardy that it grows well on various types of soils which can hardly sustain any other crop.

1.2 In a note furnished to the Committee, it has been stated that Khesari Dal contains a neurotoxin known as B-N-Oxalyl-aminoalanine (BOAA) which is said to be a powerful excitotoxin to the Central Motor Neurones. Epidemiological studies conducted by National Institute of Nutrition and Indian Council of Medical Research in Maharashtra and Madhya Pradesh indicated a link between the consumption of Khesari Dal and outbreak of neurolathyrism or popularly known as lathyrism.

1.3 This disease has two forms, latent and established. The latent form is characterised by mild pain, an alteration in gait and the difficulty in running. The victim learns only when some on-looker points out a change in his gait. In the established form patient acquires a "typical" scissors gait and often walks on tip with jerky movements.

1.4 In the preliminary status note furnished to the Committee by the Government, it has been stated that the disease is caused due to excessive consumption of Khesari Dal for a prolonged period. According to Prof. M.P. Dwivedi, Head, Preventive and Social Medicines, S.S. Medical College (Rewa), it is exceedingly difficult to identify or predict lathyrism. Dal may be consumed for a long period; lathyrism will not break out for decades, though whenever it strikes, it is sudden and violent. For unknown reasons, lathyrism may strike children but leave parents who have eaten Khesari Dal for a long period. Males are more prone of lathyrism than females the ratio being 10:1. In females, the age of onset is before puberty and after menopause. It seems that the female hormone protects them during the active productive period.

1.5 It has been further added in the note that according to another research reported in 'New Scientists' a British Science Journal, lathyrism may strike any one whose diet contains about 25 per cent of Khesari Dal for 50-180 days. But a recent outbreak of the disease in Durg and other Districts of Madhya Pradesh shows that onset can occur even much earlier. According to Dr. P.C. Rathore, Assistant Director (Research) and Registrar of Indira Gandhi Agricultural University, Raipur, lathyrism is caused when Khesari Dal consumption continued to be over 40 per cent of the food intake of a person over a period of four to five months.

1.6 The first outbreak of Lathyrism was reported in 1833 and from 1904 onwards it occurred in epidemic form in the following provinces:—

Central Provinces	:	1904, 1922, 1927, 1945 and 1951.
Gilgit Agency in Kashmir	:	1926 and 1927
United Provinces	:	1930
Punjab	:	1939
Bhopal	:	1945 and 1947
Bihar	:	1944 and 1949
Rewa State	:	1922, 1927 and 1959
West Bengal	:	1966

1.7 In the Status note furnished to the Committee, the Government have stated that the following Districts have been known to have had outbreaks of Lathyrism:

Bihar	:	Patna, Monghyr, Darbhanga
Madhya Pradesh	:	Saugor, Bhopal, Hoshingabad, Narasinghapur, Jabalpur, Damo Bilaspur, Khandwa, Raipur, Chindwara, Saoni, Rewa, Satna, Panna, Tikamgarh.
Haryana		Narnaul
West Bengal		Murshidabad
Uttar Pradesh		Allahabad, Mirzapur, Lucknow, Bareilly, Pilibhit, Lakhimpur, Bahraich, Hardoi, Rampur, Gorakhpur, Azamgarh, Ballia, Sitapur, Unnao, Badaun, Basti.

1.8 The state-wise area and production of Khesari Dal for the years 1990-91, 1991-92 and 1992-93 may be seen at Annexure-I. It may be seen from the Annexure that declining trends are prevailing in terms of area and production of Khesari Dal. However, per hectare yield has increased.

Ban on Sale of Khesari Dal

1.9 The ban on the sale and storage for sale of Khesari Dal has been in operation since 1961 under Rule 44-A of the Prevention of Food Adulteration Act (PFA) which is reproduced below:—

"No person in any State shall, with effect from such date as the State Government concerned may by notification in the official Gazette specify in this behalf, sell or offer or expose for sale, or have in his possession for the purpose of sale, under any description or for use as an ingredient in the preparation of any article of food intended for sale:—

(a) Khesari gram (Lathyrus sativus) and its products;

(b) Khesari dal (Lathyrus sativus) and its products;

(c) Khesari dal flour (Lathyrus sativus) and its products;

(d) a mixture of Khesari gram (Lathyrus sativus) and Bengal gram (Cicer Arietinum) or any other gram.

(e) a mixture of Khesari dal (Lathyrus sativus) and Bengal gram dal (Cicer-Arietinum) or any other dal

(f) a mixture of Khesari dal (Lathyrus sativus) flour and Bengal gram (Cicer-Arietinum) flour or any other flour."

The ban has been prevailing in all the States/Union Territories except State of Madhya Pradesh, Bihar and West Bengal. Since, there is no provision under PFA to ban its cultivation, Khesari Dal still continues to be grown.

1.10 The Committee has been informed in a written note that the ban on the sale and storage for sale has been imposed on the advice of the Union Ministry of Health and Family Welfare. When asked whether there was ban on the cultivation at the national level, Secretary, Deptt. of Agriculture and Cooperation during the course of oral evidence stated that no State Government was advised not to produce it. However, on the advice of Health Ministry, it was certainly stated that its production should be discouraged and efforts be made to produce alternate crops in its place.

Reason For Not Banning the Cultivation

1.11 It was pointed out by the Committee during evidence that on the one hand it has been stated that continued consumption of Khesari Dal was harmful and on the other hand it was allowed to be cultivated freely particularly in major Khesari dal growing States of Bihar, West Bengal and Madhya Pradesh as there was no ban on it. The representative of the National Institute of Nutrition during the course of oral evidence stated:—

> "Govt. has no machinery to implement the ban on cultivation.....Farmers are saying that they are growing this crop to feed the bulls. How can you stop them? We have no evidence that it causes toxin to bulls. It is always consumed. But only sometimes it comes as an epidemic when people consume it in large quantities."

Demand for lifting of Ban

1.12 A demand has been raised from some quarters for lifting of ban on the sale of Khesari Dal on the basis that the consumption of Khesari Dal is not at all harmful, but it is nutritious. In this connection, a copy of the note received from Dr. S.L. Kothari, President, Academy of Nutrition Improvement, Nagpur, may be seen at Annexure II.

1.13 Ministry of Agriculture (Deptt. of Agriculture & Cooperation) in a note submitted to the Committee has stated that a number of voices are being raised by Academy of Nutrition Improvement, Nagpur to lift the ban

on Khesari Dal. When asked whether Ministry of Agriculture is in favour of lifting of ban on Khesari Dal and if so, has it ever pursued the matter with the Ministry of Health, Ministry of Agriculture stated:—

> "The Ministry of Agriculture had reviewed the pros and cons of the ban in a meeting held under the Chairmanship of Special Secretary wherein the representatives of the Ministry of Health and Family Welfare and their Scientists strongly pleaded for the continuation of ban."

Production of Khesari Dal in other countries

1.14 Khesari Dal is also produced in other countries. As per the information furnished by the Department of Agriculture & Cooperation, it is grown in Bangladesh, Nepal, Pakistan, China, Syria and Ethopia. When asked whether other countries have also imposed ban on Khesari Dal and, if not, the reason why India alone has imposed ban, Deptt. of Agriculture & Cooperation stated in a written note as follows:—

> "As per the information available Nepal and Bangladesh have banned its use for human consumption. Pakistan does not encourage its cultivation."

CHAPTER II

EFFECTS OF CONTINUED CONSUMPTION OF KHESARI DAL

I. Views supporting consumption of Khesari Dal

2.1 In a written note furnished to the Committee by the Government it has been stated that the Academy of Nutrition Improvement, Nagpur, has been representing for lifting the ban on sale of Khesari Dal on the following grounds:—

(i) Lathyrus is a legume which can be easily cultivated, is cheaper, has high protein content, good taste and farmers prefer to cultivate it, consumers prefer to eat it.

(ii) The paralysis in man results only when Lathyrus is consumed in large quantity (200gm/day) and that too in drought years. If consumed in small quantities as a dal, it is not toxic.

(iii) Ban is only on sale of Khesari Dal and not on its cultivation. Further, States of Madhya Pradesh, Bihar and West Bengal have not banned the sale of the dal.

2.2 The Ministry of Agriculture (Deptt. of Agriculture & Cooperation) in reply to a point stated that Khesari Dal contains 29—32% of protein and this crop can withstand moisture stress more than any other legume crop. They further stated that being a pulse crop, it leads to the improvement in the fertility of soil because of the presence of root modules.

2.3 On 12th Sep. 1994, the Committee took oral evidence of the representatives of Ministry of Agriculture, Ministry of Health & Family Welfare, ICAR and National Institute of Nutrition, Hyderabad in connection with the examination of the subject—'Khesari Dal'. The Committee also heard the views of the non-official witness Dr. S. L. Kothari, President of Academy of Nutrition Improvement, Nagpur on the subject.

2.4 Explaining the position regarding the effect of intake of Khesari Dal, the non-official witness, Dr. S. L. Kothari, President, Academy of Nutrition Improvement (ANI), Nagpur, during oral evidence stated:—

> "Khesari Dal is the richest in high quality and low cost digestible protein amongst all the edible pulses in our country. However, on account of its BOAA content, this pulse has been inadvertently maligned as toxic and harmful by health authorities, even though it has been proved by a number of workers all the world over that oral consumption of existing varieties of Khesari Dal is not at all harmful, but nutritious. Unfortunately, ancient famine reports based on casual surveys attribute the occurrence of Lathyrism due to its wrong use as

a cereal (not as pulse). Even these very reports including the Booklet published by National Institute of Nutrition, Hyderabad (1988) as well as the Central Health Education Bureau, Director-General of Health Services, Government of India, New Delhi (1986) equivocally state that the daily consumption of Khesari Dal upto 25 per cent of total daily food intake (*i.e.* 200 grams) per day is harmless. As per existing nutritional standards total permissible pulse intake recommended is only 60 grams per day per person which is only a quarter of the safe limit of Khesari Dal consumption as per N.I.N., Hyderabad and Directorate of Health Services, New Delhi. It will thus, be seen that free daily consumption of Khesari Dal as a pulse is not at all harmful. Besides, there are no reports of cases of Lathyrism in normal times even in the States (M.P., Bihar, West Bengal etc.) where Khesari Dal production and consumption is maximum in the country."

2.5 To a specific query whether intake of more than 200 grams of Khesari Dal is harmful or harmless, Dr. Kothari during oral evidence categorically stated that no scientist could produce disease Laythrism even after consumption of 200 gram Khesari Dal. As to the form in which Khesari Dal should be taken, Dr. Kothari submitted during the course of oral evidence:—

"It is not harmful even if you prepare a chapati from it. I am quoting a scientific evidence which has been ignored."

2.6 When asked whether he disputed the toxic contents of the Khesari Dal, Dr. Kothari stated:—

"Toxic element is present in all the Dal."

2.7 To a query whether he had experimented to know the effects of consumption of more than 200 gms Khesari Dal in view of Khesari Dal being stated to be harmless by him and harmful by National Institute of Nutrition (NIN), Dr. Kothari stated that he had requested the Directorate General of Health Services (DHS) and NIN to experiment on him in their laboratories and he was ready to take 200 gms of Khesari Dal. However, he stated that none of them responded to his statement. He further stated:—

"Studies conducted by ANI in Khesari Dal producing terrains (1987-91) have failed to record even a single case of Lathyrism despite regular daily consumption of Khesari Dal by the population in the survey areas. Further, ANI corresponded with over three hundred recognised Scientific Research Institutes including all the National Research Institute and Medical Colleges of our country, to ascertain incidence of Lathyrism in their respective areas. None of the Institute reported any such cases nor its incidence. The status paper prepared by the Government of India, Technology Mission on Oil seeds and Pulses, New Delhi dated 18.6.1992 states "Directorate-General of

Health Services, Ministry of Health & Family Welfare intimated in April, 1989 that there are NO NEW CASES of Lathyrism in recent years, even in endemic areas of Madhya Pradesh."

2.8 Dr. Kothari further stated that Khesari Dal was wrongly attributed to be the cause of Lathyrism and pointed out that a scientific journal 'Lathyrism without Laythrus' which was published in 1940, stated that incidence of Lathyrism was also noticed where Khesari Dal was not consumed and the cause of this disease was consumption of a weed named Akta alongwith wheat grains.

2.9 Dr. S.L. Kothari during oral evidence before the Committee stated that the ban on sale of Khesari Dal was imposed on the basis of famine reports and no study was conducted by Dr. Diwedi in the Laboratory. He contended that the ban was imposed in 1961 while BOAA content was identified in 1964.

2.10 Dr. Kothari furnished to the Committee a pamphlet titled KHESARI DAL (LATHYRUS SATIVUS) brought out by him according to which Third World Medical Research Foundation, U.S.A. (1993) have suggested to all the countries to "Support scientific research and thereby spread development of Lathyrus as a food and fodder crop to promote balanced nutrition in the rainfed areas of the world which account for over 75% of the arable land."

2.11 According to Dr. S.L. Kothari, famine survey data, on the basis of which sale of Khesari was banned, was misinterpreted. In support of his contention, he has referred to the following studies in his pamphlet:

A. Studies made during famines

1. Buchanan (1904) from the famine of 1896-98 reported that people whose diet consisted of 50% or less of Khesari Dal were healthy. He had also suggested "inclusion" of Khesari Dal in diet up to 30% (*i.e.* 200 to 250 grams/day) as a safe limit.

2. Shah (1939) reported cases of Lathyrism during famine period from Punjab. He had clearly observed that Lathyrism was due to the contamination of wheat grain with grains of hardy weed *i.e.* Akta (VICIA SATIVA) and not due to Khesari Dal.

3. Minchin (1940) reported cases of clinical Lathyrism from Madras where Khesari Dal was not consumed.

4. Shourie (1945) reported that the people who developed lathyrism in Bhopal during famine period (1944-45) had usually consumed Khesari Dal grains in large amount for 6 months or more. They ate what they could get and this was mainly Khesari Dal. Villagers who mixed Khesari Dal grains with equal parts of wheat (50%) did not contract Lathyrism and were healthy.

5. Gopalan (1950) reported occurence of sporadic cases of Lathyrism from South India and found that this syndrome is not solely confined to the Khesari Dal eating population.

6. Roy (1951) did not observe ill-effects among population which was consuming it as dal for years.

7. Ganapathy & Dwivedi (1961), Dwivedi & Prasad (1964), Dwivedi and Mishra (1975), Kulkarni et al (1977) Atal et al (1978) had made identical observations after famine outbreaks.

B. Studies made during normal times

8. The Scientists of Academy of Nutrition Improvement, Nagpur (Sharma et al, 1991 and Kothari et al 1991) conducted "Community Nutrition Studies" in 7 districts of Maharashtra and 3 districts of M.P. covering 310 villages between 1987-91. During these studies, 20,659 people consuming Khesari Dal since birth between the age of 10 to 95 years were interviewed and examined. The study did not reveal any person whose physical health, activity or productivity was affected. On the contrary many gave credit of their excellent health and productivity to its presence in their daily diet.

2.12 In the context of Laboratory Studies on Animals and Humans, Dr. Kothari made reference to the following studies:—

1. Rats:—

   Visco (1923), Mc Carrison (1928), Zagami (1932), Mc Carrison and Krishnan (1934), Patwardhan (1946) Lewis et al (1948), Shastri et al (1963), Ramchand et al (1981), failed to produce Lathyrism in rats by feeding Khesari Dal seeds.

2. Ducks, Monkeys, Dogs:—

   Diaz & Vivanco (1942), failed to produce even symptoms of Lathyrism in any of the three species of Animals *i.e.* Rats, Dogs and Monkeys by feeding diet containing Khesari Dal obtained from regions where outbreak of Lathyrism was reported. Stockman (1929), Patwardhan (1952), Dastur & Iyer (1958), Dastur (1962), Nagarajan et al (1965) could not produce Lathyrism in monkeys after feeding Khesari Dal over prolonged period and concluded that Khesari Dal seeds may be non-toxic.

3. Humans:—

   Keshler (1942), NIN Ann. Report (1975, 1978), Rao (1993) could not produce Lathyrism in Human beings by feeding liberal quantities of Khesari Dal in daily diet.

2.13 Dr. Kothari further cited studies conducted by Nagarajan et al (1965), Rao & Sharma (1967), Mani et al (1971), NIN Ann. Report (1976), Parker et al (1979), Spencer et al (1986) which failed to produce Lathyrism in rats, monkeys and human beings by feeding pure BOAA in the diet.

II. Views Opposing the Consumption of Khesari Dal

2.14 In a written note furnished to the Committee by the Government it has been stated that the Ministry of Health and Family Welfare have the following points of views in support of continuation of ban on the sale of Khesari Dal:—

(i) In the changing agricultural scenario it would be possible to cultivate alternate crops such as Bengal gram, Lentil, Oilseeds (and even wheat in the area with irrigation facilities like Bana Sagar in Rewa) etc. These crops yield better and offer remunerative price to farmers.

(ii) The advantage of price, taste and higher protein is negligible when the damage to nervous system of human is considered.

(iii) The preference of consumers and farmers is due to lack of adequate knowledge on the harmful effects of consumption of lathyrus.

(iv) Adequate studies are not available to prove either consumption of small amount say 20-30 gms per day would not lead to subclinical symptoms/or it would cause irreparable damage to the nervous system.

(v) The lifting of the ban on sale is likely to convey a wrong signal about its safety. It may encourage large scale cultivation, sale and consumption and then suddenly there could be resurgence of outbreaks of Lathyrism.

(vi) During recent years Lathyrus is raised as a animal feed and fodder crops so ban on cultivation may not be fully justified.

2.15 It was further stated in the written note that in March 1991 a proposal for lifting the ban on sale of Khesari Dal was received from Government of Maharashtra. The matter was considered in detail by the Ministry of Health & Family Welfare in consultation with various technical experts and Institutes such as National Institute of Nutrition, Hyderabad, ICMR and Directorate General of Health Sevices and it was decided at the level of Health & Family Welfare Minister that keeping in view the scientific opinion of NIN, Hyedrabad, the existing ban should continue in the larger public interest. The Government of Maharashtra was informed about the decision.

2.16 In reply to a query as to the availability of evidence to show that the disease of Lathyrism occurred wherever people consumed Lathyrus Sativus, Dr. Ramesh Bhatt, the representatives of the National Institute of Nutrition, Hyderabad during evidence stated:

"We have unequivocal evidence to indicate that consumption of Lathyrus Sativus is harmful both to animals as well as to humans. During the Second World War, it used to grow in Europe in many

countries. Nazis fed this Lathyrus Sativus to Jewish prisoners of Romanian origin. Out of the 1,200 people who had been fed, 800 people had come down with Lathyrism. Among 1,200 people, 300 people have subsequently migrated to Israel. In Israel these people are even today suffering with this disease and the study published in 1993 indicates that among the people 40 people had died. They have the records for this and 19 have cancer. So, they are now questioning by saying that here is a human experiment conducted by the Nazi Government and here is the eivdence about the longevity. It is true that at that time the Nazis had fed fairly more amount of Khesari Dal.

This problem is there in other parts of the world also. A study published in 1990, described an outbreak of this Lathyrism in Ethiopia. In India, I would like to add to what our colleagues from the Ministry of Agriculture have said. Although statistical figures are available in certain States, Lathyrus Sativus is grown even in Bidar district of Karnataka and in Medak district of Andhra Pradesh. There is a clandestine cultivation because the people are afraid to come out in open. What the Hon'ble Members were asking earlier was about the availability of evidence to show that there is this disease of Lathyrism wherever people consume Lathyrus Sativus. Our emphatic answer is 'yes'. Even today, cases of Lathyrism exist in Bidar district of Karnataka and in Medak district of Andhra Pradesh and a Rapid assessment survey conducted in the districts of Garchiroi, Chandrapur and Bhandara district of Maharashtra, revealed 16 active cases of Lathyrism."

2.17 He further added:—

"The Director of Medical Services, Government of Maharashtra wrote a letter to the District Medical Officers to find out whether there were any cases of Lathyrism. The District Medical Officers sent that letter down to Primary Health Centres and the reply was 'no'. But I went personally and had a meeting with the PHOs and I have found cases of Lathyrism there."

2.18 However, when specifically asked whether Khesari Dal is the sole cause of Lathyrism or any other thing could lead to this disease, Dr. Bhatt stated:—

"This is a riddle which we are not able to solve. In a one lakh population if everybody consume the same amount then will everybody come down with the same extent of the disease, the answer is 'no'. It is only certain individuals who come down with the disease. Now we are doing some metabolic studies in the laboratory to find out whether some people are deficient in certain metabolic processes. But one thing is certain that there is no genetic variation.

The second thing is that there could be variation in the toxic content. If the same variety is grown in different locations, the toxic content may go up and down depending upon the region. If there is water stress, if there is some other risk, the BOAA content may go up and down. So, that is the reasons why it sometimes happens like that."

2.19 Regarding the effect of consumption of Khesari Dal on various kind of animals; the representative of NIN submitted during evidence that according to some study, it affected animals also. The list of animals was pretty long. Some of these were rats, monkeys, horse, sheep, etc. Some group of animals were fairly resistant and some group of animals were very susceptible. The highly susceptible species to Lathyrism include horses, sheep, goat and, of course, humans, The resistant species included monkeys, rats, mice, etc. Even if the villagers were given Laythrus free of cost for the horses or goat they would say 'no' because they were highly susceptible species. There was a Court case in England in 1890 or so where the horses were forced to eat Lathyrus by East India Company officials and they claimed compensation for that. In bulls, it was harmless. People had been feeding the bulls with this. In fact they thought it was a very good source of protein. The bull was a very highly resistant animal, but the horse was highly susceptible. In human species, mans more susceptible, that is, male is more susceptible than female. For some reason, females are resistant despite the possession of toxic. There are a variety of seeds. Some countries such as France, Algeria and Russia had banned this long ago. Since they had banned it long ago, this problem did not arise there.

2.20 When pointed out to the progress report of Prof. S.L.N. Rao of Osmania University form 1.12.91 to 20.2.93 which stated that human can quantitatively metabolise/detoxify the toxin present in Khesari Dal when the intake is 50-100 gms and as such the report had questioned the very scientific basis of the ban, Ministry of Health & Family Welfare replied in a written note as follows:—

"Such type of statements/conclusion are rather hastily drawn and Dr. S.L.N. Rao's single observation cannot in any way erase the medical and scientific records of epidemic outbreaks of neurolathyrism in humans due to Khesari Dal consumption. It is difficult to believe that the humans who were susceptible to Khesari Dal toxicity have suddenly developed ability to metabolize/or detoxify the toxin. On the other hand, even if one believes that a limited amount of the toxin (from 50-100gram of Khesari Dal) could be metabolized in the body, a distinct possibility of variation in humans with regard to their inherent capacities to detoxify this exogenous toxin has to be evaluated. Until such data is obtained and carefully examined, it is premature to state unequivocally that Khesari Dal consumption is not a health hazard to humans."

2.21 Ministry of Health and Family Welfare also stated that as per the report of Dr. Rao, humans should be the least susceptible to the toxin

from L. Sativus. However, contrary evidence suggests that the neurotoxic symptoms to L. Sativus or its toxin could be produced only after a very high level of ingestion in experimental animals compared to humans. A Table showing toxic dose of BOAA to cause neurological symptoms in experimental animals and humans as furnished by the Ministry of Health is at Annexure III.

2.22 As regards the intake of Khesari Dal that could lead to the Lathyrism, Dr. Bhatt referred to the findings of study conducted by Dr. Misra of King John Medical College, Lucknow and stated during evidence as follows:—

> "Earlier studies show (1976) that in Amgaon Block a large number of people are affected with this disease. 200 gms. for each person was the cut off point. But more recent studies indicate that this need not be the case. Here, Dr. Misra of King John Medical College, Lucknow has come out with a study in 1993 which shows that people who consume as low as 70 gms. of Lathyrus Sativus also have come down with the disease."

He further added:

> "Now a general impression has been created thanks to widespread publicity through the media that consumption of small quantity of Khesari Dal is harmless. It will have chronical effect if even below 200 grams of Dal is consumed. Immediately after three months, people may not come with a crippling paralytic disease but will have some very sensitive changes. That means if a person at the age of 20 years, 22 years or 24 years, when he is young adult will consume Lathyrus after 20, 25 or 30 years if you see him he will have neurological problems."

2.23 Ministry of Health and Family Welfare in reply to a point also supported this view and stated:

> "Recent published evidence (Misra et al. Clinical aspects of neurolathyrism in Unnao, India. Paraplegia 31, 249-254, 1993) indicated that human subjects consuming Khesari dal around 70gm to 250gm (average 105gm) were affected with neurolathyrism. This clearly indicate that even comsumption of as low an amount as 70gm is harmful. While doing a risk analysis study to assume a safe dosage, the international practice is to divide the no effect level by a factor of minimum 10. Under this circumstance, and as per latest evidences it is obvious that we cannot assume that 'low intake of Khesari dal is not harmful'."

2.24 A pamphlet entitled "you can prevent Lathyrism" brought out by Directorate General of Health Services states that if the consumption of Khesari Dal is necessary, it should not be consumed in excess of one fourth of food and pulses in daily diet. It further states that by research it has been proved that toxic element in dal can be easily removed and thereafter dal can be consumed without any harm.

2.25 The Committee further wanted to know the number of times the Government entrusted the task to find out the effects of consumption of Khesari Dal since 1961 and the names of the agencies engaged for this purpose. The Ministry of Health and Family Welfare in a written reply furnished to the Committee stated as under:—

"The effects of consumption of Khesari Dal are under constant review since 1961 by the various scientific studies, which are follows:—

1. Dwivedi M.P. & Prasad B.C. 1963
2. Rao 1964
3. Dwivedi M.P. and Mishra S.S. 1975
4. Kulkarni et al. 1977
5. Dwivedi M.P. & G. Gopalan 1983
6. Spencer P.S. et al. 1986
7. Spencer et al. 1987
8. Haimonot et al. 1990
9. Hugon et al. 1993
10. Cohn 1993
11. Bhatt and Amruth 1994
12. The Government of Madhya Pradesh had also conducted a Knowledge, attitudes and Practices (KAP) study in 1989.
13. The Government of Maharashtra has also constituted a Consultative Committee in 1992."

2.26 When asked about the brief findings of each of such agencies/ bodies, the Ministry of Health and Family Welfare replied:—

"The scientific studies conducted so far revealed that occurrence of the disease was invariably found associated with the consumption of Lathyrus Sativus."

2.27 Regarding BOAA content in Khesari Dal, Representative of the Deptt. of Health stated that BOAA content contained in Khesari Dal was proved in 1920 or prior to it.

2.28 In a note furnished to the Committee about the latest studies on the effects of cunsumption of Khesari Dal, the Government have stated that the Agriculture Minister had decided that the matter should be reviewed afresh in a meeting to be held under the Chairmanship of Special Secretary(D). This meeting was held on 5.11.1992 in which Dr. Kothari of ANI, officers from the Ministry of Agriculture, Ministry of Health and Welfare, Scientists of ICAR and NIN, Hyderabad participated. Dr. Kothari of ANI pleaded for the removal of ban whereas the scientists of NIN, Hyderabad and Ministry of Health pleaded for the continuation of ban. The Chairman, therefore, decided that a study be entrusted to an independent body like Central Food Technology Research Institute (CFTRI) Mysore or Central Toxicology Research Centre (ITRC) Lucknow

to find out the question of lathyrism due to cunsumption of Khesari Dal. ITRC, Lucknow has agreed to take up the study and the proposal of the institute has also been agreed to.

2.29 Asked about the progess of the study done by ITRC, Lucknow, the Deptt. of Agriculture & Cooperation informed:—

> "The Industrial Toxicological Researh Centre, Lucknow submitted a project on our request 'A study on the possible health implication on consumption of Lathyrus Sativus (Khesari Dal)' in the end of October, 1993. The study is to be completed tentatively in 3 years' time. The Ministry conveyed approval in the end of November, 1993. Since 1994-95 is the Ist year of study, it is likely to be completed by 1996-97."

Steps taken to create Public Awareness

2.30 The Committee have been informed that Ministry of Health have taken steps to create awareness among people about the effects of consumption of Khesari Dal through public health programmes. The representatives of Health Ministry admitted that it was not possible to go door to door through health services but it was possible to take preventive measures. He submitted before the Committee that since Ministry of Health was concerned to create public health awareness, they created an information system in 1970 for this purpose and a lot of material was developed to create public awareness in this regard. However, it was admitted that the Government could not be as successful as was expected to create public awareness. As regards the steps taken to highlight effects of consumption of Khesari Dal, Ministry of Health submitted:—

> "The Directorate General of Health Services have brought out a pamphlet entitled 'You Can Prevent Lathyrism' wherein the ill-effect of consumption of Khesari Dal have been highlighted. This pamphlet had been circulated to all the States/UTs for wide publicity."

CHAPTER III

PROCESSING OF KHESARI DAL FOR SAFE CONSUMPTION AND DEVELOPMENT OF ALTERNATIVES

Methods of Processing of Khesari Dal

3.1 Since toxic element is present in Khesari Dal, the Committee sought to know the possible methods by which the toxic element could be removed. The Ministry of Agriculture (Deptt. of Agriculture & Cooperation) in a note furnished to the Committee informed that Steeping and Parboiling are the two methods by which Khesari Dal is processed in order to remove the toxin. In the steeping process a large volume of water is first brought to boil in a big vessel and at the boiling of water, fire is removed and the seeds are poured into the hot water and left over for about 2 hours. After such steeping the steep water is drained off completely and seeds are washed once with a fresh lot of cold water which is also drained off. The seeds are then sub-dried.

3.2 Seeds are first soaked in cold water for 12 hours in masonary tanks in Parboiling process. The water is drained off and wet seeds are charged into a steaming kettle (to hold about 6 bags each) and steamed for 20 to 30 minutes. Steam is cut off and the hot seeds are again charged into masonary tanks filled with cold water and allowed to soak for about an hour. The soaked water is drained off and the seeds are then dried on the ground in 'drying pialas'. 80 to 90 per cent of toxic is removed by both the methods.

3.3 Detailing the processing methods of Khesari Dal, the representative of the NIN stated:

> "Some villagers have special techniques of parboiling it and draining the water. In this way, 90 to 95 per cent of toxic will be removed. A few villagers have this ancient widsom.
>
> Earlier we have been working mostly on the principle of toxicity. But during the couple of years, all over the world, risk analysis approach is being followed. The risk posed by the particular substance is analyzed. This has components like risk assessment, risk management and risk communication. Risk assessment begins with hazard identification. We have to find out whether it is hazardous or not. Next is hazard characterization. Third is exposure evaluation. Final is, risk characterization. After this, we have to take the risk managment. In Canada and in France also, they are growing Lathyrus Sativus to feed their pigs. They feed a particular quantity and they

have the diet control. Here, it is human beings, Here, we cannot have any legislation to say you eat only 20 grams.

We need to have techinques of risk management and ultimately risk communication. We have failed in risk communication approach because of variety of other problems."

3.4 Asked whether toxic element would come down if the husk is removed and whether that process could be encouraged, Dr. Ramesh Bhatt submitted during oral evidence:—

"We are asked whether it is in the husk or in the whole seed—When we boil excess of water toxin comes into the water. You remove the water. Then, it is fit for consumption. In South India, we have the practice of only drinking Rasam. We do not want the water to be lost. We thought whoever prepares roti, they can do this practice. But, then, there are pactical problems in this. They will not easily accept it."

3.5 Dr. S.L. Kothari from ANI furnished a pamphlet titled KHESARI DAL (LATHYRUS SATIVUS) brought out by ANI to the Committee which states:-

"Toxin present in Khesari Dal is water soluble and 60% to 90% is removed just by soaking overnight in water or for 2 hrs. in once boiled water Mohan et al (1966), Nave et al (1989), N.I.N. Publication 1988 (Lathyrism — A Preventable Paralysis)."

3.6 As the processing methods could remove the toxicity of the Khesari Dal, the Committee wished to know whether Union Government proposes to make processing before sale mandatory and whether there were bottlenecks if it chose to make processing compulsory in all the States. The Ministry of Health & Family Welfare informed:—

"This Directorate has brought out the pamphlets wherein the method of steeping and parboiling process before consumption of Khesari Dal have been outlined. The pamphlet have been circulted to States/ UTs."

3.7 In a note furnished by the Ministry of Agriculture it was stated that the seeds of Khesari Dal containes 28% protein, which is more than commonly grown pulses. Yet the major problem is the presence of lathyrogen, low and unstable productivity. Lathyrogen is water soluble amino acid (BOAA) and is responsible for including lathyrism due to regular consumption. Many efforts have been made to develop varieties free from BOAA content. Ministry of Agriculture (Deptt. of Agriculture & Cooperation) in a note further informed the Committee that only one variety 'Nirmal' has been officially notified and released in West Bengal. Another low toxic variety "Pusa-24" was identified during 1976 but could not be released due to insufficient data of minikit trials. Therefore, the seed of this variety was neither produced nor cultivated. Campbell and briggs (1987) were able to isolate a line LS824 of lathyrus by further

selection in Pusa 24 and this line has BOAA content of 401ug/g as against 2600ug/g in parental line P24. Dr. S.L. Mehta of IARI has also developed some BOAA free lines using genetic engineering, which could be used as donors in improvement programmes.

3.8 As to the present state of research to develop low-neurotoxin variety of seeds, the representative of the ICAR stated in the oral evidence:—

> "After imposition of ban in 1961 on its sale, we have taken up work on BOAA. The first variety was developed and released in West Bengal in the name of Nirmal. This was released in 1972. Efforts continued and in 1976, P-24 was developed and was identified by the Identification Committee but could not be released because of certain other reasons. Later on, three varieties LSG-1, 3 and 6 have been developed but they are still in testing stage. Recently, we have developed a variety. It is Pusa Selection-505. This variety is being tested in different climatic conditions and if it is suitable, we will definitely be releasing it after Nirmal which was released in 1972."

3.9 Asked whether toxic problem would be solved by latest variety of seed, the representative of ICAR assured that if Pusa Selection-505 is proved to be right one, the solution to the problem would definitely come out because neither government had control nor they could do anything on the cultivation of Laythrus. He further opined that if this variety is developed and released, existing variety of seed would have to be withdrawn from farmers and a law prohibiting the use of old variety would have to be framed. If this happened, the ban on Khesari Dal could be lifted. Reacting to this point, Dr. Bhatt agreed and stated:—

> "It is possible. But there is the question of extension."

3.10 When asked whether any research has been done in coordination between ICAR and Nutritional Institutions under Ministry of Health about the development of low toxin varieties and/or processing technology, the Committee has been informed that there has not been coordination between ICAR and Nutritional Institutions for developing low neurotoxic varieties or processing technology. However, anti nutritional factors of Khesari Dal have been studied at National Institute of Nutrition, Hyderabad and CFTRI, Mysore.

3.11 Dr. Kothari from ANI was not in favour to reduce level of toxic element in Khesari Dal, as he considered BOAA content harmless to the body. Asked whether low level of toxic element in Khesari Dal would be harmful, Dr. Kothari quoted Dr. Mehta of ICAR to say that nobody has been able to categorically answer, based on hard facts, as to what would be the truly safe level. But most people have agreed that below two percent is quite safe.

3.12 When asked whether he agreed with Dr. Mehta, Dr. Kothari stated:—

> "I agree that all level is safe."

Cultivation of Alternate Crops in place of Khesari Dal

3.13 Regarding the efforts made to find out alternate crops which can substitute the cultivation of Khesari Dal effectively, the Ministry of Agriculture informed the Committee in a note as follows:—

> "There is definitely a need to study the crop compatibility in the situation where Khesari survives. In some areas lentil has proved good substitute for Khesari but under extreme moisture stress conditions, Khesari performs better then lentil."

3.14 In the preliminary status note, the Committee has been informed that the Government of Madhya Pradesh have identified areas where Khesari Dal can be replaced by gram/linseed/lentils/peas/safflower.

3.15 On the possibility of cultivation of alternate crops, representative of NIN during evidence informed:—

> "As regards alternate crops, in fact, in 1978 in Madhya Pradesh, all the 58 districts have been drought-hit. Shri M.S. Swaminathan feared that there could be an outbreak of lathyrism. The scenario has changed. Government is giving rice and wheat at subsidised rate. There was no outbreak in Madhya Pradesh because of Government intervention despite all the districts being declared drought-hit. For alternate crops, it is possible. Even in Madhya Pradesh, because of the irrigation facilities which are coming up and because of the price incentive, people are going in for alternate crops. Lakari is grown only when water is available in field. Economically, farmers may not get that much return if they grow Ding and Rajnadgan. We discussed with people in Medak district whether they can grow alternate crops. They can and they can give example. But the farmers think that there is not that much of profit out of lathyrus."

PART B

CONCLUSIONS AND RECOMMENDATIONS OF THE COMMITTEE

1. The Committee examined the entire evidence placed before it on the subject of Khesari Dal. The basic question which the Committee addressed itself to was whether on the basis of available evidence the casual relationship between the consumption of Khesari Dal and the incidence of neurolathyrism, could be established unmistakably. In this context, the evidence produced by the National Institute of Nutrition, Hyderabad is worth serious consideration. It is to be noted that the controversy regarding the toxic effect of Khesari Dal is at least a century old and various countries, based on their own experience, have banned its consumption. It can be said that the NIN has made some serious efforts to establish the casual relationship between the consumption of Khesari Dal and the occurrence of lathyrism not only within the country but outside also. In this context the example of Nazi authorities feeding Khesari Dal to Jewish prisoners and more than 65% of them going down with lathyrism cannot be easily dismissed, as it can be safely assumed that the Nazi Government would not have fed the Jews with this Dal had they not been convinced about its effect on human health. It has also been brought to the notice of the Committee that countries like France, Algeria, Russia, Bangladesh and Nepal have banned its consumption. Further, the Ministry of Health has taken a consistent view that evidence suggests that consumption of Khesari Dal causes lathyrism, and the Ministry of Agriculture has also gone along with the Ministry of Health in this regard.

Evaluating the evidence, the Committee find that all are agreed on one point, namely the toxic content of Khesari Dal. The disagreement is on whether consumption of Khesari Dal causes lathyrism. The representative of Academy of Nutrition Improvement, Nagpur, vehemently denies it and states emphatically that as per the study conducted by the Academy there is no evidence that lathyrism is caused by the consumption of Khesari Dal.

The Committee feel that the question whether consumption of Khesari Dal causes lathyrism is to be decided on the basis of empirical tests. It is surprising that even after a number of studies have been conducted this controversy has not been set at rest.

After evaluating the claims and conclusions of various parties, the Committee come to the conclusion that enough epidemiological studies in respect of lathyrism or conclusive empirical tests with regard to the casual relationship between the consumption of Khesari Dal and incidence of lathyrism have not been done so far. This conclusion of the Committee is

strengthened by the fact that the Government has assigned to the Lucknow based Industrial Toxicological Research Centre, a fresh study on the subject, whose result will be available in 1997.

The Committee, however, feel that study by one institute, howsoever independent it may be, is not adequate in view of the fact that such studies which have been undertaken by individual agencies in the past, have not led to their findings being accepted by all. Since a serious health hazard to the public is involved, a serious approach is urgently called for. Keeping in view that the interest of the farmers may not be jeopardized any longer, the Committee recommend that a high powered Committee comprising representatives of ICAR, Ministries of Health, Agriculture, Governments of major Khesari Dal growing States and National Institute of Nutrition should be set up *within one month* to undertake a scientific study using all the technological expertise available at present to decide whether consumption of Khesari Dal causes lathyrism with the mandate to complete the study *within 6 months.* The ICAR should be asked to take the lead and coordinate the study.

2. The Committee find that the ban on the sale of Khesari Dal was imposed in 1961 under Prevention of Food Adulteration Rules, 1955 on the ground that its consumption is associated with the disease 'Lathyrism' causing crippling paralysis. The Committee note that the major Khesari Dal growing States of West Bengal, Bihar and Madhya Pradesh have not imposed ban on its sale. The Committee note that no ban has been imposed on its cultivation all over the country, as it is not feasible to implement the ban. As a result, Khesari Dal continues to be cultivated and consumed. The Committee are, therefore, of the opinion that the purpose of containing health hazard has not, in any way, been served by the partial ban on Khesari Dal. The Committee feel that lifting of ban on the sale of Khesari Dal at this juncture would be premature as it has not been conclusively proved that consumption of Khesari Dal does not lead to lathyrism. The ban on sale was imposed hoping that once the sale is banned, the farmers would feel discouraged to cultivate it. This has not happened. The Committee feel that the ban should continue till it is conclusively proved that consumption of Khesari Dal does not lead to the outbreak of lathyrism.

3. An important point brought to the attention of the Committee is that there are some tested methods to remove the toxicity of Khesari Dal, before its consumption. Although the claim about the percentage of toxicity that can be removed through these methods, varies, the Committee feel that these methods should be popularised. It is admitted that Khesari Dal contains about 28% protein which is the highest among pulses. If, therefore, the toxicity could be removed or neutralized, it would be a good and cheap source of protein for the impoverished people. The Committee note that the Ministry of Health and Family Welfare have brought out some pamphlets

outlining the methods of removing the toxic content in Khesari Dal. The Committee recommend that a vigorous publicity campaign should be undertaken both by the Central and State Governments to popularise these methods by drawing out specific publicity programmes and by allocating sufficient funds for it on priority basis. The Committee also recommend that the Government should consider seriously the question of making these processing methods compulsory before the consumption of Khesari Dal mandatory in the interest of the health of the people and bring out a legislation in this regard.

4. The Committee note that the Government have been making efforts to develop varieties of Khesari Dal with very low content of BOAA. They also note that in 1972 one variety known as Nirmal was notified and released for cultivation in West Bengal and thereafter no other variety could be developed successfully for cultivation in other parts of the country. No details are available with regard to the cultivation of Nirmal, its acceptance by the farmers, the toxic content, its impact on the consuming public etc. The Committee note that even after a lapse of 22 years as after 1972 the research efforts have not yielded any fruitful results in the matter. The Committee would like to be apprised of the reasons as to why the research efforts could not bear fruit. The Committee desire that the Government should speed up the research activities with sufficient funding in order to develop a low toxic variety of Khesari Dal which could be cultivated all over the country. The Committee also recommend that a suitable strategy should be evolved whereby the farmers could be encouraged to take up cultivation of alternate crops in place of Khesari Dal.

New Delhi;
14*th February*, 1995

25*th Magha*, 1916 *(Saka)*

NITISH KUMAR,
Chairman,
Standing Committee on Agriculture

ANNEXURE—I

(*Vide* Para 1.8 of the Report)

AREA AND PRODUCTION OF LAKH/KHESARI FOR 1990-91 TO 1992-93

States	Area '000 hectares			Production '000 tonnes			Yield Kg/ha.		
	1990-91	1991-92	1992-93	1990-91	1991-92	1992-93	1990-91	1991-92	1992-93
Bihar	304.1	271.0	214.0	240.2	212.1	176.3	789	782	822
Madhya Pradesh	674.9	625.9	500.6	278.1	329.8	254.8	412	527	509
Maharashtra	36.5	19.4	31.9	14.2	4.2	8.1	389	211	250
West Bengal	44.8	39.8	37.3	29.1	25.3	43.1	644	625	1162
Total above States	1059.3	956.1	783.8	561.6	571.4	482.3	531	597	615

ANNEXURE II

(*Vide* Para 1.12 of the Report)

Academy of Nutrition Improvement

Soyamilk Complex, Sitabuldi, Wardha Road, Nagpur-440012 (M.S.), India.

Ref...../*1994* *Date*.....

Note presented in the meeting of Parliamentary Standing Committee on Agriculture held at New Delhi on 12th Sept., 1994

IMPORTANCE OF LIFTING EXISTING BAN ON KHESARI DAL (L. SATIVUS)

Khesari dal is the richest in high quality and low cost digestible protein amongst all the edible pulses in our country. However, on account of its BOAA content, this pulse has been inadvertantly maligned as toxic and harmful by health authorities even though it has been proved by a number of workers all the world over that oral consumption of existing varieties of Khesari Dal is. not at all harmful, but nutritious. Unfortunately, ancient famina reports based on casual surveys attribute the occurrence of Lathyrism due to its wrong use as a cereal (not pulse). Even these very reports including the Booklet published by National Institute of Nutrition, Hyderabad (1988) as well as the Central Health Education Bureau, Director-General of Health Services, Government of India, New Delhi (1986) equivocally state that the daily consumption of Khesari Dal up to 25% of total daily food intake (i.e. 200 grams) per day is harmless. As per existing nutritional standards total permissible pulse intake recommended is only 60 grams per day per person which is only quarter of the safe limit of khesari dal consumption as per N.I.N., Hyderabad and Directorate of Health Services, New Delhi.

It will, thus, be seen that free daily consumption of KD as a pulse is not at all harmful. Besides, there are no reports of cases of Lathyrism in normal times even in the states (M.P., Bihar, West Bengal etc.) where KD production and consumption is maximum in the country. Studies conducted by ANI in KD producing terrains (1987—91) have failed to record even a single case of Lathyrism despite of regular daily consumption of KD by the population in the survey areas. Further, ANI corresponded with over three hundred recognised scientific research Institute including all the National Research Institute and Medical Colleges of our country to ascertain incidence of lathyrism in their respective areas. None of the Institutes reported any such cases nor its incidence. The status paper prepared by the Government of India, Technology Mission on oil seeds and pulses, New Delhi dated 18.6.1992 state "Directorate-General of Health Services, Ministry of Health and Family Welfare intimated in April, 1989 that there are no NE CASES of Lathyrism in recent years, even in endemic areas of Madhya Pradesh."

It is, thus, evident that the ban on this useful protein rich cheap source of Nutritious Food (Khesari Dal) is continuing unabated only on flimsy hypothetical grounds which is tendom to the national cause of upliftment of masses below the poverty line (BPL population), denying easily available cheap source of edible protein.

It is, therefore, submitted that a very serious thought be given to solve this burning problem on top priority basis solely in NATIONAL interest of the common man and marginal farmers of RAINFED areas.

(Dr. S.L. KOTHARI)
PRESIDENT,
Academy of Nutrition Improvement
Soyamilk Complex, Wardha Road, Sitabuldi
NAGPUR-440012.

Date : 12.9.1994

(*Vide* Para 2.21 of the Report)

Table 1. Toxic dose of BOAA required to cause neurological symptoms in experimental animals and humans

Sl. No.	Species	Route of Administration	Symptoms	Dose of BOAA per kg b.wt. in g.	Lathyrus sativus Equivalents* per 50 kg b.wt. in kg.	Reference study
1	2	3	4	5	6	7
1.	Infant mice	I.P.	Convulsions Rentinal damage	0.35	2.2	Olney *et al* (1976)
2.	Mice	I.P.	Convulsions	0.75	4.7	Liu *et al* (1989)
3.	Wistar rat	Intrathecal	Permanent hind leg paralysis	0.0040	0.0025	Chase *et al* (1985)
4.	10-14 days old rat	I.P.	Convulsions	0.70	4.4	NIN Studies (1989)
5.	Chicka	I.P.	Opisthotoms hind leg retraction convulsions	0.70	4.4	Liu *et al* (1989)
6.	Guinea pig	I.P.	Paralysis of hind limbs	1.0	6.25	Rao (1992) (Unpublished)

1	2	3	4	5	6	7
7.	Monkey	Oral	Spastic para-parcsis	1.10	6.9	Spencer *et al* (1986)
8.	Horse	Oral	Hind limb paralysis	0.16 0.04	1.2 0.3	
9.	Sheep	Oral	Hind limb paralysis	0.40 0.10	2.5 0.65	Abegaz (1991)
10.	Humans	Oral	Spastic para-parcsis (varying degrees)	0.032**	0.2 (per day)	Dwivedi & Prasad (1964)
11.	Humans		-do-	0.015 to 0.15	0.1 to 1.0	Kessler (1947)***

Average b.wts. : Horse: 300kg; Sheep : 50kg *Assuming an average concentration of 0.8gm. BOAA/100g.
Ration/day : 2.5 kg., 7kg.; **L. sativus**
**Calculated ***Forced Labour Camp victim of world war II
L.S. — 400gms 3 months of daily diet

According Ling to SLN. Rao (1992, personal communication) most of the BOAA administered to guinea pigs gets excreted unchanged while in humans it is suspected to be metabolized.

APPENDIX-I

MINUTES OF THE FIFTIETH SITTING OF THE STANDING COMMITTEE ON AGRICULTURE HELD ON MONDAY THE 12TH SEPTEMBER, 1994, AT 1500 HOURS IN COMMITTEE ROOM 'C', PARLIAMENT HOUSE ANNEXE, NEW DELHI

The Committee sat from 1500 hrs. to 1630 hrs.

PRESENT

Shri Nitish Kumar—*Chairman*

MEMBERS

Lok Sabha

2. Shri Birbal
3. Shri Nathuram Mirdha
4. Shri Sarat Pattanayak
5. Shri Govindrao Nikam
6. Kum. Pushpa Devi Singh
7. Shri Channaiah Odeyar
8. Shri Tara Singh
9. Shri Rajvir Singh
10. Shri Rudrasen Chaudhary
11. Shri Rajendra Kumar Sharma
12. Shri Ram Tahal Chaudhary
13. Shri Upendra Nath Verma
14. Shri Shibu Soren

Rajya Sabha

15. Shri Ram Narayan Goswami
16. Shri Anant Ram Jaiswal
17. Dr. Bapu Kaldate
18. Shri K.N. Singh
19. Shri Maheshwar Singh
20. Dr. Ranbir Singh
21. Shri Shiv Charan Singh
22. Shri H. Hanumanthappa

WITNESSES

1. Shri J.C. Pant, Secretary (Deptt. of Agriculture & Cooperation)
2. Shri N. Rama Rao, Jt. Secy. -do-
3. Dr. B.M. Sharma, Director (CP) -do-
4. Dr. D.P. Singh, ADG, I.C.A.R.
5. Dr. B.K. Tiwari, Adviser Nutrition and ADG (PFA), M/o Health & Family Welfare
6. Dr. Ramesh Bhat, Dy. Director, National Institute of Nutrition, Hyderabad
7. Shri Sagwa Singh, Asstt. Commissioner

8. Dr. S.L. Kothari, President, Academy of Nutrition Improvement, Nagpur
9. Dr. Ashok Kaikini, -do-

SECRETARIAT

1. Shri S.C. Gupta — *Joint Secretary*
2. Shri P.D.T. Achary — *Director*
3. Shri S. Bal Shekar — *Under Secretary*

1. The Committee took oral evidence of the representatives of the Ministry of Agriculture, Ministry of Health & Family Welfare, ICAR and National Institute of Nutrition, Hyderabad in connection with the examination of the subject—'Khesari Dal'. The Committee also heard the views of the non-official witness—Dr. S.L. Kothari, President of Academy of Nutrition Improvement, Nagpur on the subject.

2. At the outset, the Chairman welcomed the official and non-official witnesses and drew their attention to Direction 58 of the Directions by the Speaker relating to examination of witnesses by the Parliamentary Committees and then invited Dr. S.L. Kothari, the non-official witness to give his views on the subject in the first instance.

Effect of continued consumption of Khesari Dal on Human Beings

3. Regarding the effects of continued consumption of Khesari Dal, Dr. S.L. Kothari, President, Academy of Nutrition Improvement, Nagpur (ANI), submitted as under:—

> "Khesari Dal is the richest in high quality and low cost digestible protein amongst all the edible pulses in our country. However, on account of its BOAA content, this pulse has been inadvertently maligned as toxic and harmful by health authorities, even though it has been proved by a number of workers all the world over that oral consumption of existing varieties of Khesari Dal is not at all harmful, but nutritious. Unfortunately, ancient famine reports based on casual surveys attribute the occurrence of Lathyrism due to its wrong use as a cereal (not as pulse). Even these very reports including the Booklet published by National Institute of Nutrition, Hyderabad (1988) as well as the Central Health Education Bureau, Director-General of Health Services, Government of India, New Delhi (1986) equivocally state that the daily consumption of Khesari Dal upto 25 per cent of total daily food intake (*i.e.* 200 grams) per day is harmless. As per existing nutritional standards total permissible pulse intake recommended is only 60 grams per day per person which is only quarter of the safe limit of Khesari Dal consumption as per N.I.N., Hyderabad and Directorate of Health Services, New Delhi. It will, thus, be seen that free daily consumption of Khesari Dal as a pulse is not at all harmful. Besides, there are no reports of cases of Lathyrism in normal times even in the States (M.P., Bihar, West Bengal etc.)

where Khesari Dal production and consumption is maximum in the country."

4. As regards the efforts made by him and his institute with respect to the study on the effect of Khesari Dal, he informed as under:—

"Studies conducted by ANI in Khesari Dal producing terrains (1987-91) have failed to record even a single case of Lathyrism despite of regular daily consumption of Khesari Dal by the population in the survey areas. Further, ANI corresponded with over three hundred recognised scientific research institutes including all the National Research Institute and Medical Colleges of our country, to ascertain incidence of Lathyrism in their respective areas. None of the Institutes reported any such cases nor its incidence. The status paper prepared by the Government of India, Technology Mission on Oil Seeds and Pulses, New Delhi dated 18.6.1992 states "Directorate-General of Health Services, Ministry of Health & Family Welfare intimated in April, 1989 that there are NO NEW CASES of Lathyrism in recent years, even in endemic areas of Madhya Pradesh."

5. Dr. Kothari pointed out that he had been asking NIN, Hyderabad and the Ministry of Health to give him a single evidence of harmful effects of the consumption of Khesari Dal for the last six years. But they had not responded to him.

6. As to the total intake that would be harmless, Dr. Kothari averred that no scientist has produced Lathyrism even after consuming Khesari Dal in the form of 'Chapati'. To a query whether he disputed the toxic content of the Khesari Dal, Dr. Kothari stated:—

"Toxic element is present in all the dal."

7. Dr. Kothari also stated that no study was conducted by Dr. Dwivedi. Instead the ban on Khesari Dal was imposed on the basis of Famine Report. There was no laboratory test. He stated that BOAA content was identified in 1964 whereas the ban was imposed in 1961.

8. He also stated that he had requested DHS and NIN that they could experiment on him in their laboratory and he is ready to take 200 gms. dal.

9. In reply to a query as to the availability of evidence to show that the disease of Lathyrism occurred wherever people consumed Lathyrus Sativus, the representative of the National Institute of Nutrition, Hyderabad stated:—

"We have unequivocal evidence to indicate that consumption of Lathyrus Sativus is harmful both to animals as well as to humans. During the Second World War, it used to grow in Europe in many countries. Nazis fed this Lathyrus Sativus to Jewish prisoners of Romanian origin. Out of the 1,200 people who had been fed, 800 people had come down with Lathyrism. Among the 1,200 people,

300 people have subsequently migrated to Israel. In Israel these people are even today suffering with this disease and the study published in 1993 indicates that among the people 40 people had died. They have the records for this and 19 have cancer. So, they are now questioning by saying that here is a human experiment conducted by the Nazi Government and here is the evidence about the longevity. It is true that at that time the Nazis had fed fairly more amount of Khesari Dal.

This problem is there in other parts of the world also. A study published in 1990, described an outbreak of this Lathyrism in Ethiopia. In India, I would like to add to what our colleagues from the Ministry of Agriculture have said. Although statistical figures are available in certain States, Lathyrus Sativus is grown even in Bidar District of Karnataka and in Medak District of Andhra Pradesh. There is a clandestine cultivation because the people are afraid to come out in open. What the Hon'ble Members were asking earlier was about the availability of evidence to show that there is this disease of Lathyrism wherever people consume Lathyrus Sativus. Our emphatic answer is 'yes'. Even today, cases of Lathyrism exist in Bidar district of Karnataka and in Medak district of Andhra Pradesh and a rapid assessment survey conducted in the districts of Garchiroi, Chandrapur and Bhandara districts of Maharashtra, revealed 16 active cases of Lathyrism."

He further added:—

"The Director of Medical Services, Government of Maharashtra wrote a letter to the District Medical Officers to find out whether there were any cases of Lathyrism. The District Medical Officers sent that letter down to Primary Health Centres and the reply was 'no'. But I went personally and had a meeting with the PHOs and I have found cases of Lathyrism there."

10. On the point as to whether consumption of very low quantities of Khesari Dal would be harmful to the humans, the representative of the National Institute of Nutrition, Hyderabad, informed the Committee as follows:—

"Earlier studies show (1976) that in Amgaon Block a large number of people are affected with this disease. 200 gms. for each person was the cut off point. But more recent studies indicate that this need not be the case. Here, Dr. Misra of King John Medical College, Lucknow has come out with a study in 1993 which shows that people who consume as low as 70 gms. of Lathyrus Sativus also have come down with the disease.

Now a variety of agricultural changes have taken place. Thanks to Green Revolution, the scenario changed and the price of rice is less than that of the pulses. Now again the scenario is changing. In

Chandrapur rural area, Lathyrus is sold at Rs. 7.50 per kg. despite a ban on it, whereas rice is sold at Rs. 8.50 or Rs. 9.00 per kg. Rural women bring on their head loads of rice and exchange them with Lathyrus. If the price of rice is higher naturally they will sell it in the market and will eat Lathyrus Sativus. They will lend themselves into trouble.

Now a general impression has been created—thanks to widespread publicity through the media—that consumption of small quantity of Khesari Dal is harmless. It will have chronic effect if even below 200 grams of Dal is consumed. Immediately after three months, people may not come with a crippling paralytic disease but will have some very sensitive changes. That means if a person at the age of 20 years, 22 years or 24 years, when he is young adult, will consume Lathyrus after 20, 25 or 30 years if you see him he will have neurological problems."

11. Regarding the effect of consumption of Khesari Dal on various kinds of animals, he submitted that according to some study, it effected animals also. The list of animals was pretty long. Some of these were rats, monkeys, horses, sheep, etc. Some group of animals were fairly resistant and some group of animals were very susceptible. The highly susceptible species to Lathyrism include horses, sheep, goat and, of course, humans. The resistant species included monkeys, rats, mice, etc. Even if the villagers were given Lathyrus free of cost for the horses or goat they would say 'no' because they were highly susceptible species. There was a Court case in England in 1890 or so where the horses were forced to eat Lathyrus by East India Company officials and they claimed compensation for that. In bulls, it was harmless. People had been feeding the bulls with this. In fact they thought it was a very good source of protein. The bull was a very highly resistant animal, but the horse was highly susceptible.

12. In human species, man is more susceptible, that is, male is more susceptible than female. For some reason, females are resistant despite the possession of toxic. There are a variety of seeds. Some countries such as France, Algeria and Russia had banned this long ago. Since they had banned it long ago, this problem did not arise there.

13. To a query whether consumption of Khesari Dal is responsible for Lathyrus disease or could any other thing be responsible for it, Dr. Bhatt stated:—

"This is a riddle which we are not able to solve. In a one lakh population if everybody consumes the same amount then will everybody come down with the same extent of the disease, the answer is 'no'. It is only certain individuals who come down with the disease. Now we are doing some metabolic studies in the laboratory to find out whether some people are deficient in certain metabolic defects. But one thing is certain that there is no genetic variation.

The second thing is that there could be variation in the toxic content. If the same variety is grown in different locations, the toxic content may go up and down depending upon the region. If there is water stress, if there is some other risk, the BOAA content may go up and down. So, that is one reason why it sometimes happens like that."

14. Dr. Bhatt also submitted that wherever Lathyrus was not cultivated there was no disease of this kind.

15. As to the ban on the cultivation of Khesari Dal, he said it is impossible to implement it as Govt. has no machinery to implement it.

Steps taken to create Public Awareness

16. The Representative of the Ministry of Health informed that BOAA content was proved in 1920 or prior to it, which is regarded as toxic and reflected bad effects in the form of Neuro-Motor paralysis. He further stated that Ministry of Health had been taking steps to create awareness among people about the effects of consumption of Khesari Dal through public health programmes. He admitted that it was not possible to go door to door through health services but it was possible to take preventive measures. Based on this principle, infrastructure was developed and ban imposed. He further submitted that since Ministry of Health was concerned about creating public health awareness they created an information system in 1970 for this purpose and a lot of material was developed to create public awareness in this regard. However, he categorically admitted that all this could not be as successful as was expected. He however, stressed that it was only the public awareness programmes through which they could reach the grass roots.

Processing of Khesari Dal for Safe consumption

17. Detailing the processing methods of Khesari Dal, the representative of the NIN stated:—

"Some villagers have special techniques of parboiling it and draining the water. In this way, 90 to 95 per cent of toxic will be removed. A few villagers have this ancient wisdom.

Earlier we have been working mostly on the principle of toxicity. But during the last couple of years, all over the world, risk analysis approach is being followed. The risk posed by the particular substance is analysed. This has componets like risk assessment, risk management and risk communication. Risk assessment begins with hazard identification. We have to find out whether it is hazardous or not. Next is hazard characterisation. Third is exposure evaluation. Final is, risk characterisation. After this, we have to take the risk management. In Canada and in France also, they are growing Lathyrus Sativus to feed their pigs. They feed a particular quantity and they have the diet control. Here, it is human beings. Here, we cannot have any legislation to say, you eat only 20 grams.

We need to have techniques of risk management and ultimately risk communication. We have failed in risk communication approach beacue of variety of other problems."

He further added:—

"We are asked whether it is in the husk or in the whole seed. When we boil excess of water, toxin comes into the water. You remove the water. Then it is fit for consumption. In South India, we have the practice of only drinking Rasam. We do not want the water to be lost. We thought whoever prepares roti, they can do this practice. But then there are practical problems in this. They will not easily accept it."

Development of low toxin variety

18. Shri J.C. Pant, Secretary, Department of Agriculture and Cooperation placing the views concerning his Deptt., stated that the ban either on sale of cultivation of Khesari Dal had been imposed by the Department of Health and not by the Deptt. of Agriculture. He was of the opinion that the ban which is under PFA should be lifted. He further added that Agriculture Deptt. was concerned with the development of low toxic variety of seed of Khesari Dal in which they had not succeeded so far.

19. Regarding research on the development of low toxin variety of Khesari Dal, representatives of ICAR revealed as follows:—

"After imposition of ban in 1961 on its sale, we have taken up work on BOAA. The first variety was developed and released in West Bengal in the name of Nirmal. This was released in 1972. Efforts continued and in 1976, P-24 was developed and was identified by the Identification Committee but could not be released because of certain other reasons. Later on, three varieties LSG-1, 3 and 6 have been developed but they are still in testing stage. Recently we have developed a variety. It is Pusa Selection-505. This variety is being tested in different climatic conditions and if it is suitable, we will definitely be releasing it after Nirmal which was released in 1972."

20. To a query whether toxic problems would be solved by the latest variety of seeds, he submitted that if Pusa Selection-505 proves to be right seed, then the solution to the problem would definitely come. A ban on the cultivation is not possible as neither the Government has control over the cultivation nor they could do anything about it. He further said that if this variety is developed and released, the existing variety of seed would have to be withdrawn from farmers and a law prohibiting the supply as well as germination of the old variety would have to be made. When this is done the ban on Khesari could be lifted, he added.

Cultivation of alternate crops

21. On the possibility of cultivation of alternate crops, representative of NIN informed:—

"As regards alternate crops, in fact, in 1978 in Madhya Pradesh, all the 58 districts have been drought-hit. Shri M.S. Swaminathan feared that there could be an outbreak of Lathyrism. The scenario has changed. Government is giving rice and wheat at subsidised rate. There was no outbreak in Madhya Pradesh because of Government intervention despite all the districts being declared drought-hit. For alternate crops, it is possible. Even in Madhya Pradesh, because of the irrigation facilities which are coming up and because of the price incentive, people are going in for alternate crops. Lakari is grown only when water is available in field. Economically, farmers may not get that much return if they grow Ding and Rajnandgaon. We discussed with people in Medak district whether they can grow alternate crops. They can and they can give example. But the farmers, think that there is not that much of profit out of Lathyrus."

The witnesses then withdrew.

22. * * * * *

The Committee then adjourned.

APPENDIX II

MINUTES OF THE SITTING OF THE STANDING COMMITTEE ON AGRICULTURE HELD ON WEDNESDAY, 11TH JANUARY, 1995, IN COMMITTEE ROOM 'B', PARLIAMENT HOUSE ANNEXE, NEW DELHI

The Committee met from 1100 hrs. to 1220 hrs.

PRESENT

Shri Som Pal — *In the Chair*

MEMBERS

Lok Sabha

2. Shri D. Pandian
3. Shri Birbal
4. Shri G. Ganga Reddy
5. Shri Ankushrao Raosaheb Tope
6. Shri Govindrao Nikam
7. Shri Tara Singh
8. Shri Anantrao Deshmukh
9. Shri Uttamrao Deorao Patil
10. Shri V.V. Nawale
11. Shri Rudrasen Choudhary
12. Shri Ganga Ram Koli
13. Dr. Parshuram Gangwar
14. Shri Rajendra Kumar Sharma
15. Shri Arjun Charan Sethi
16. Shri Upendra Nath Verma
17. Shri Zainal Abedin
18. Dr. R.K.G. Rajulu

Rajya Sabha

19. Shri Ram Narain Goswami
20. Shri Anant Ram Jaiswal
21. Dr. Bapu Kaldate
22. Shri Bhupinder Singh Mann
23. Shri N. Thangaraj Pandian
24. Shri S.K.T. Ramachandran
25. Shri K. N. Singh
26. Shri Shiv Charan Singh
27. Shri H. Hanumanthappa

SECRETARIAT

Shri P.D.T. Achary — *Director*

In the absence of the Chairman of the Committee, Shri Som Pal, M.P., who was authorized by the Chairman to chair the meeting of the

Committee welcomed the members to the sitting of the Committee. He placed the agenda before the Committee.

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2. The Committee then took up for consideration the Draft Report on Khesari Dal. The Members, while approving the recommendation regarding the constitution of a high powered Committee, said that the time limit should be specified by the Committee.

After some discussion, the Committee unanimously made the following modifications in the last para of the first recommendation:—

Since a serious health hazard to the public is involved, a serious approach is urgently called for. Keeping in view that the interest of the farmers may not be jeopardized any longer, the Committee recommend that a high powered Committee comprising representatives of ICAR, Ministries of Health, Agriculture, Government of major Khesari Dal growing States and National Institute of Nutrition should be set up *within one month* to undertake a scientific study using all the technological expertise available at present to decide whether consumption of Khesari Dal causes Lathyrism with the mandate to complete the study *within 6 months*. The ICAR should be asked to take the lead and co-ordinate the study.

The Committee then adopted the Draft report unanimously and authorized the Chairman to finalise and present the Report on behalf of the Committee to Parliament.

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The Committee then adjourned.