



**GEOSPATIAL ASSESSMENT OF COMMON ILLNESS DUE TO ENDOSULFAN
IN PERIYA ESTATE, KASARAGOD DISTRICT, KERALA, INDIA**

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ABSTRACT

The use of pesticides has a hostile impact on human health and the environment. The environmental health problems vary from region to region, reflecting the geography, climate and the level of economic development. Many health problems are associated not only with poverty, a lack of essential resources and also in relation with the mode of operating the hazardous materials which became a burning issue during the past few years. The pesticide Endosulfan was aerielly sprayed on the cashew plantation in the district, covering an area of 2190 hectare by the Plantation Corporation of Kerala which has many negative impacts on environment and human health. This chronic disease is vulnerable to local community, which affects more than 3,000 people with various problems such as mental retardation, cancer and physically handicapped, skin problems etc. This study aims to highlight the role of physiography and drainage system in spreading disease at Periya estate. The robust methodology is adopted in GIS platform to analyse the proximity of the settlements from the estates. This paper also portrays the people who live near the downstream and downwind of the estate were adversely affected. As a conclusion of this study, is that it is not only the use of the pesticide that has affected the health of the people but the natural environmental conditions have also played a role in the diffusion of the toxin and its persistence in the environment. The dreadful pesticides like Endosulfan will affect the health of future generations.

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INTRODUCTION

In the 20th century Rachel Carson, a scientist and writer, revolutionized America's interest in environmental issues. Her book, *Silent Spring*, published in 1962, highlighted the impacts of pesticides and awakened society to its responsibility to other forms of life. Endosulfan is a pesticide which is classified as a Persistent Organic Pollutant (POP) under the Stockholm convention. Endosulfan belongs to the organochlorine group of pesticides and has been used worldwide since the 1950's. It is used in vegetables, fruits, paddy, cotton, cashew, tea, coffee, tobacco and timber crops (Environmental justice foundation, 2002). Endosulfan is a restricted-use pesticide that is particularly effective against aphids, fruit worms, beetles, leafhoppers, moth larvae, and white flies on a wide variety of pests. It is not approved for residential use. Endosulfan is applied to crops by aerial or ground-level spray. Worldwide, use of Endosulfan increased with the ban on the use of the more persistent organochlorine pesticides like DDT and

Endrin. Earlier it was considered as a safer alternative to other organochlorine pesticides in many countries but in the last two decades many countries have recognized the hazards of the wide usage of this pesticide and have restricted its use (WHO). Endosulfan is intensely toxic and has been involved in many cases of poisoning and fatalities. It is highly toxic if inhaled, swallowed or absorbed through the skin. Ingestion or breathing high levels of Endosulfan may lead to death. Endosulfan directly affects the central nervous system. Endosulfan has been linked to mental retardation and death among farm workers, especially in circumstances when the chemical was applied excessively or improperly. According to Ton P.T. Selvere and S.Vodouhe (2000) in 1999-2000 during cotton season in Benin's Borgou province many deaths occurred due to Endosulfan poisoning. Misra, Savvy Saumya (2011) found that Muthalamada and Kollengode panchayats in Palakkad district, Kerala showed more cases of hydrocephalus. The Kokkada, Patrame and Nidle villages in Belthangady taluk of Dakshina Kannada, Karnataka was using Endosulfan till 2001 in the plantations owned by the Karnataka Cashew Development Corporation.

Need For the Study

Kasaragod, the northern most district of Kerala is a lush region with large cashew and betel plantations. The use of pesticides

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in the cashew plantations has resulted in long term negative impacts on the health of the people living in the vicinity. This paper briefly outlines these impacts.

Aim and Objectives

The aim of the research presented here is to assess the common illness spread due to the use of Endosulfan in Periya estate of Kasaragod District, Kerala.

The objective of the study is to identify the role of physiography and drainage in the spreading of disease due to the usage of Endosulfan in Periya estate of Kasaragod District, by using GIS (Geographic Information System) technique.

METHODOLOGY

In this study both primary and secondary resources have been used to understand the spatial impact of the use of Endosulfan on human health. The primary survey was mainly a GPS survey to delineate estates. Secondary data sources used for this study is the data collected from the Community Health Center (CHC) and Primary Health Center (PHC)'s of two affected panchayats and from Endosulfan rehabilitation center at Kasaragod District. The survey of India topographical sheets of Kasaragod district at the scale of 1:50,000 are used. By using GIS (QGIS (1.8.0 Lisbon) and ARC GIS (10.1)) software's mapping was done.

Study Area

Kasaragod is the northern most district of Kerala state and is named after Kasaragod Town which is the administrative headquarters of the district. Kasaragod district lies between 12° 12'N and 12° 30'N latitude and 74° 26'E and 74° 52'E longitudes. The district lies between the Western Ghats and the Lakshadweep Sea. The eastern part is hilly with small forest tracts.

The land scape is dominated by the characteristic coconut palms with accompanying hills and streams flowing into the sea. Agriculture and horticulture dominate in this area, especially in the hilly areas. Cashew plantations dominate in this region and there are three large cashew plantations. Figure 1 shows the location of Kasaragod district.

RESULTS AND DISCUSSION

In Kasaragod district there are three main cashew estates- Kasaragod estate, Cheemeni estate and Rajapuram estate. They are mostly located in the eastern part of the district. Kasaragod estate lies in the north east with a small portion in the west. Rajapuram estate lies in the east and Cheemeni estate lies in the extreme south. These three estates are spread over 20 villages. All the three estates include forests within them. Kasaragod Plantations cover an area of 2190.00 ha. Figure 2 shows the location of Cashew plantations in Kasaragod district.

Large areas of forests were cleared for these plantations. Subsequent to this there was a large infestation of tea mosquitoes which affected the cashew plantations. So Endosulfan was frequently used to control this pest. Because of the large size of the cashew trees, Endosulfan was sprayed aerially and the fallout of this was that between 1976 and 2000, more than 50,000 villagers were exposed due to Endosulfan sprayed on the cashew plantations owned by the Plantation Corporation of Kerala. The plantation areas are mostly situated on the hills and the people are living in the valleys and slopes. Many of the habitations are almost surrounded by the plantations. Water sources are seen plenty in the plantation areas as well as in the border areas. One of the streams "Swarga" has its origin in the plantation hills itself.

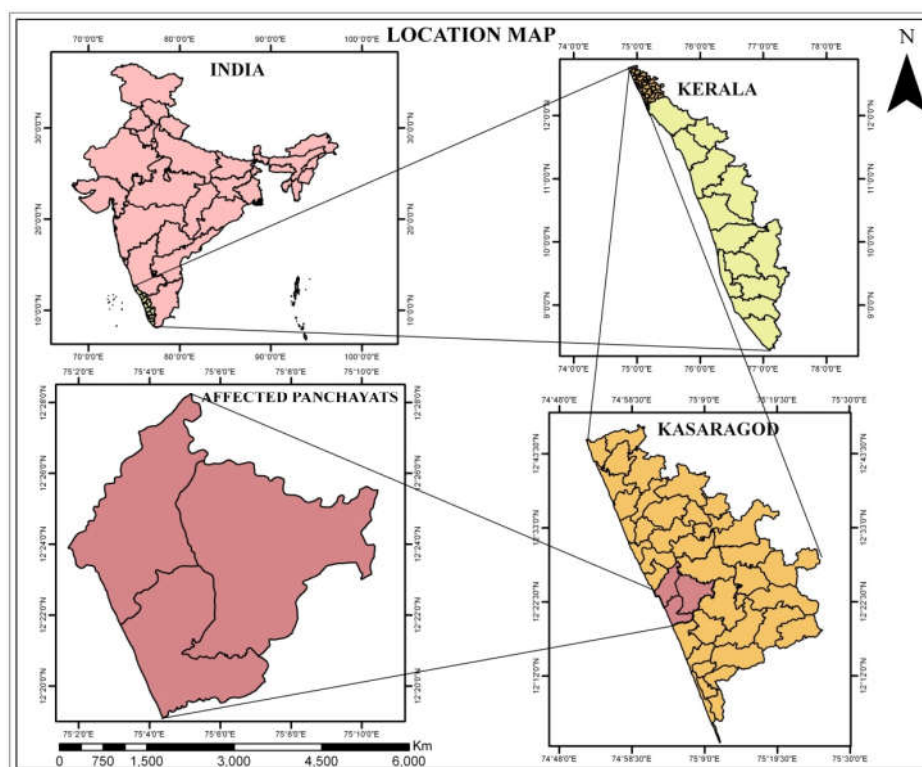


Figure 1 Location map of Kasaragod district, Kerala

The Endosulfan contaminated water from the hills of the plantations drained into the streams and nearby wells which formed the source of drinking water for all the houses in the valley. The insect killer was sprayed aerially with helicopters. As the plantations are mostly in mountainous areas, the pesticide drained and washed down the slopes during rains into drinking water below.

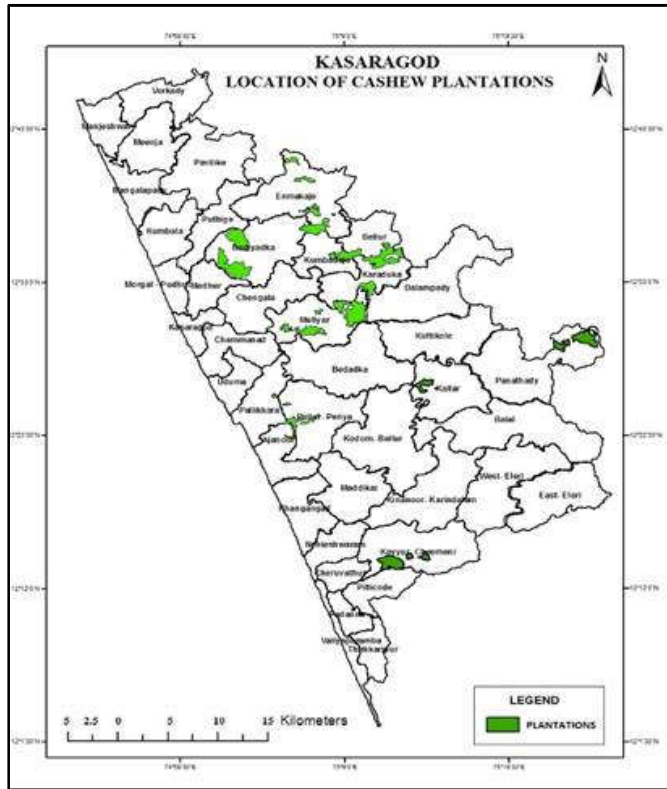


Figure 2 Location of Cashew plantations in Kasaragod District

Consumption of this water resulted in health problems ranging from physical deformities, cancers, birth disorders and damages to brain and nervous system. More than 3000 people living near, downstream and downwind of these estates were affected. Congenital birth defects, reproductive health problems, Cancers, loss of immunity, neurological and mental diseases were reported among the villagers. Following a public outcry a number of health based scientific studies confirmed that the health problems were directly linked to the exposure to Endosulfan. The studies done by the National Human Rights Commission (NHRC) and the National Institute of Occupational Health (NIOH) in 2001 has observed that "aerial exposure" to Endosulfan was responsible for delay in sexual maturity among the adolescents. Residues of Endosulfan were found in human blood samples, soil and water.

Aerial spraying of Endosulfan was done in Kasaragod District by the Plantation Corporation of Kerala during the last 24 years. More and more health problems, were reported from the areas surrounding the plantations. Of the 37 panchayats that come under Kasaragod district, eleven panchayats, namely, Ajanur, Badiadka, Enmakaje, Kallar, Karadka, Kayyur-Cheemeni, Kumbadaje, Muliyar, Panathady, Bellur and Pullur-Periya, adjoining the cashew plantations have been selected as Endosulfan-affected areas.

Physiography of the Periya estate in the Incidence of illness

Periya estate is a division of Kasaragod Plantations which covers an area of 290.00 hectares is in Kanhangad block in

Hosdurg taluk of Kasaragod district. It covers three Panchayats - Pullur- periya, Ajanur and Pallikkare. Periya division is divided in to seven blocks of cashew estates. Of these five blocks of estates - Kuniya, Pannikkunnu, Periya 1, Periya 2, and Panayal have cashew plantations. In the remaining two estate blocks - Pullur and Chittari, the cashew plantations have been converted into rubber plantations. Part of Periya 2 block has now been given to the Central University of Kerala. The Panayal cashew plantation block is in Pallikkare Panchayat. Figure 3 shows the location of Periya estate.

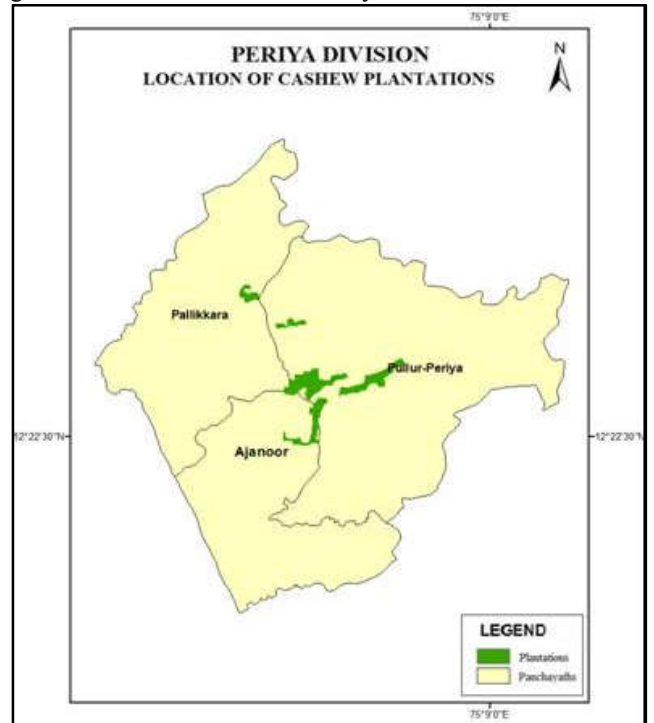


Figure 3 Location of Cashew plantations

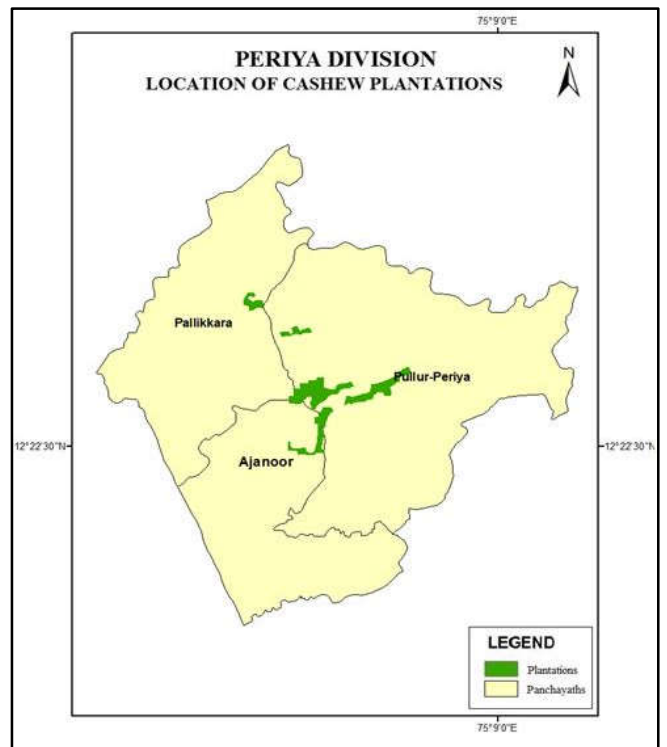


Figure 4 Location of cashew plantations with streams

Periya estate is located in Pullur – Periya, Ajanur and Pallikkare panchayat. In Periya estate all the plantations are located on the slopes whose average elevation is 100mts. It is seen from Figure 4 that numerous streams start from the plantations and many of the settlements are located along these streams. Cashew plantations are located mostly Pullur- Periya Panchayat where settlements are seen only along the stream that flows towards the north. Many small streams from the Periya plantations flows through this panchayat and joins the Chittari puzha. In Periya division population is very high so the number of victims in this area is more comparing to other panchayats. Out of eleven Endosulfan affected panchayats more number of victims are seen at Pullur-Periya and Ajanur panchayats.

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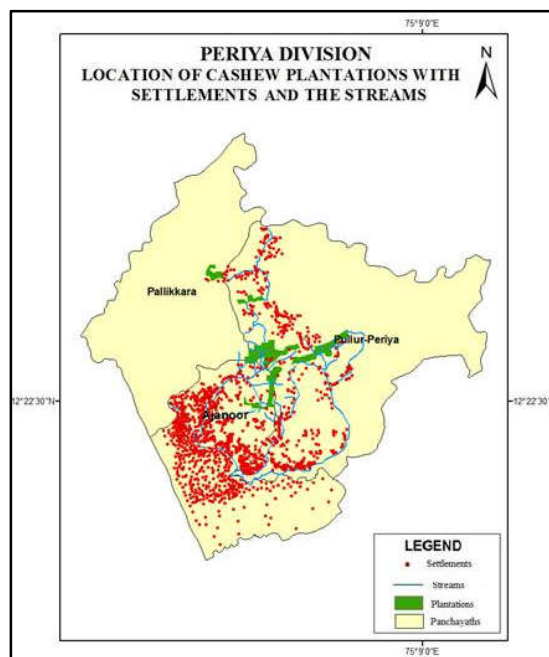


Figure 5 Location of Settlements along with streams

Figure 6 shows the villages that lie within a radius of one and two kilometers from the cashew plantations. It is seen that most of the villages lie within a radius of one kilometer from the plantation.

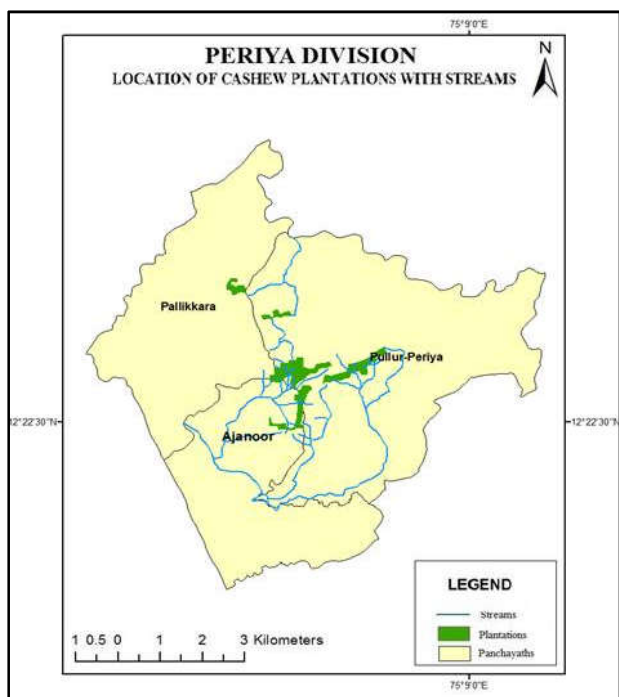


Figure 4 Location of cashew plantations with streams

Figure 5 shows Periya division of Kasaragod Estate with settlements and streams. It is seen that all the settlements are concentrated along the streams especially in the south west. In both Periya and Pullur village the settlements are seen only along the stream that flows towards the north. In Ajanur Panchayath in both Ajanur and Chittari village the settlements are seen only along the streams. Settlements are also seen inside the plantations.

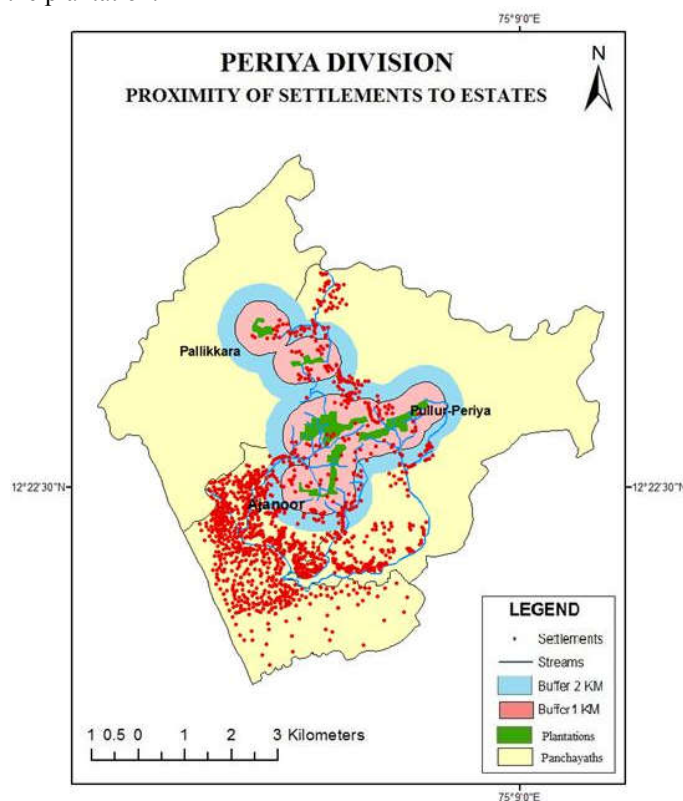


Figure 6 Proximity of settlements to estate

Major health problems seen in these two panchayats are breathing problems, skin irritation, mental retardation and congenital anomalies were common among new born babies. Infertility, cerebral palsy, mental retardation, asthma and skin diseases besides other neurological problems were common among the villagers. Cancers were on the rise. Gynecological problems were common among the women. Other health problems like Parkinson's disease, Rheumatism, Down

syndrome, loss of hearing, muscular dystrophy were prevalent. It is seen that mental retardation and cancers are rampant in both panchayats. In Pullur- Periya Panchayat there are 530 Endosulfan victims and more victims are seen in Periya village than in Pullur Village. This is probably because Pullur has very little portion of the plantation. The CHC (Community Health Center) at Periya reports that Cerebral palsy and Mental retardation in this area is mainly in the age group below 20 and cancers were common in the age group above 35. In Ajanur Panchayat there are 580 victims and more victims are seen in Chittari village than in Ajanur village. Although there is only one plantation the number of victims is high because of the larger population. The major types of diseases seen in this panchayat are Mental retardation, Cerebral Palsy, Cancers, and skin diseases. It is seen that those in the age group below 35 is mostly affected. These two panchayats have the highest population and consequently large number of victims. It is seen that the number of victims is less in the villages that do not have plantations. In pallikare panchayat similar cases are reported but the number of victims is 91. Plantation covers a very few area of this panchayat.

These two panchayats have the highest population and consequently large number of victims. It is seen that the number of victims is less in the villages that do not have plantations. It is also seen from figure 6 that proximity to the plantations seems to have an effect on the health of the villagers. Thus it is seen that the physiography of the region in terms of the numerous streams that flow in the region and the nature of the soil has played a great role in the translocation of the pesticides from the plantations where it was used to the settlements. This has adversely affected the health of the people.

CONCLUSION

Green Revolution has resulted in the indiscriminate use of pesticides. The growth of agro chemical industries and the dependence of agriculture on chemical farming has led to the extensive use of a range of toxic pesticides with its concomitant effects on human health and well-being.

The present study has been successful in detailing the location of cashew plantations, the number of streams that are originating from these plantations and the proximity of the settlements from these plantations. Majority of the settlements seen on the banks of these rivers are having serious health issues. The buffer maps drawn around the estates show that all the affected villages lie within a 2 km radius of the plantation boundary and large number of them lie within a radius of 1 km. In this area health issues are seen beyond 2 km, so physiography plays a major role in the translocation of pesticides to the settlements. Studies are still incomplete regarding the effects of POPs (Persistent Organic Pollutant) on human health and it is not clear whether the succeeding generations will also be affected.

In the light of the above it is important that great caution has to be taken to minimize or avoid the use of chemicals in agriculture. There is an urgent need to go back to earth friendly ways of farming and living.

References

1. Environmental Justice Foundation (EJF, 2002) "End of the Road for Endosulfan: A Call for Action against a Dangerous Pesticide". London.
2. Misra, S.S. (2010) "State of Endosulfan", An Article in Down to Earth.
3. NIOH Report (2003). "Final report of the investigation of unusual illnesses allegedly produced by endosulfan exposure in Padre Village of Kasaragod district, Kerala". National Institute of Occupational Health, Indian Council for Medical Research, Ahmedabad.
4. Ton P.T. Selvere and S.Vodouhe, (2000). Endosulfan deaths and poisonings in Benin. Pesticide News No. 47. *The Journal of Pesticide Action Network*, UK.
5. World Health Organization (WHO, 2000) "Poisons Information Monograph 576. Chemical: Endosulfan". International Programme on Chemical Safety (IPCS). Geneva, Switzerland.

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