

Letters To The Editor

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SIZES AND SHAPES OF HAILSTONE IN INDIA

In their paper on the dynamics of large hailstones, Bilham and Relf,¹ from aerodynamical considerations, have drawn the conclusion that the maximum weight and size of a spherical hailstone will be about 1.5 lbs. and 5 inches diameter respectively. Further, Schumann² has shown that the water content of clouds and upward air velocities occurring therein are sufficient to account for the formation of hailstones at least 8 cm. (about 3 inches) in diameter. In India, the size and weight of the largest stones have been observed to be much greater than the above limits. In this note, the question of the maximum sizes as well as the shapes of hailstones observed in this country has been examined.

Sizes of hailstones.

Hailstones as large as golf-balls have been observed in Europe³, and in America, stones of the size of a baseball or large orange have frequently occurred⁴. A record of size for the United States of America was established in the storm at Pottar, Nebraska, on July 6, 1928, when one hailstone was as big as a large grapefruit and had a circumference of 17 inches and weighed one and a half pounds. In India, hailstones of sizes bigger than the above have been reported. In his paper on "Remarkable Hailstorms in India from 1851 to 1855", Buist⁵ stated that the "largest hailstones seem to be from 10 to 13 inches (in circumference) and to weigh from 9 to 18 ounces"; in a later paper⁶ (in which hailstorms in India during the fifteen year period 1883-97 are discussed) by Eliot, there are some storms listed during which the largest hailstones weighed over 2 lbs. The occurrence of such large hailstones in India is also referred to in a comparatively recent Indian publication⁷. Indeed, hailstones in India sometimes attain such a large size and fall in so much abundance that besides the destruction of standing crops and damage to property, cattle and even human beings are stoned to death and the havoc caused may even seem almost incredible. Field⁸, in a paper on the

meteorology of India, observed: "When hailstorms occur, they are frequently on their mettle to surpass those of Europe. Cases are on record when hailstones of five inches or more in diameter have wiped out a whole village, destroying all life, man and animal; and in Simla I have seen ordinary corrugated iron roofing show daylight through cracks in it overhead after the passage of a burst of hail". There are also reports on record of hailstorms during which many buffaloes in a large area in Kathiawar were killed by blows from large hailstones. A remarkable example on record is that of the hailstorm which occurred in Peshawar on the 28th March, 1928, when a number of picketed aeroplanes kept in the open were severely damaged by very big hailstones⁹. During a hailstorm, said to be the severest in living memory, which swept over Meerut (U.P.) on the 14th January, 1938, at 2 P.M., some hailstones were reported to be *bigger than golf-balls* and fell with machine-gun rapidity, piercing the tiled roofs of many houses. In January, 1939, showers of hailstones, which caused three deaths, great damage to crops and loss of a large number of cattle, fell in Jakhaura and the neighbouring villages in Jhansi district (U.P.); some of these hailstones were reported to be "*as heavy as three pounds*". On the 19th January, 1950, hailstones of the size of cricket balls fell in a mountain village 42 miles northeast of Jammu, injuring 12 persons. The classical example of a devastating hailstorm is, however, that of the storm on the 30th April, 1888 in the Moradabad district which cost about 250 human lives¹⁰. All these reports indicate that hailstones larger in size than the limits of 5 inches in diameter and 1½ lbs. in weight given by Bilham and Relf¹ from aerodynamical consideration, have fallen in India. Hailstones weighing as much as 7½ lbs. (5 times the above limits), reported to have fallen in the Nirmal Taluk of Adilabad district (Hyderabad) on the 17th March, 1939¹¹, should, however, be considered as exceptional even in India.

Shapes of hailstones.

During the discussion on Bilham and Relf's paper, Bonacina¹² had remarked that he doubted whether the spherical form of hailstone was really the predominant form and suggested that "more attention than hitherto should be given to the shapes of hailstones". He also thought that "jagged and irregular stones

would do the most damage". Botley¹³ later mentioned, in confirmation of Bonacina's speculation, the fact that hailstorm consisting of "jagged lumps of ice" did much damage in the Northern Transvaal in 1936. In India too, not much attention has so far been given to the shapes of hailstones. On this matter Buist⁵ has remarked that "their forms are so seldom regular, that it is rarely possible to deduce the one face from the other". On examining the details of the hailstorms reported in Eliot's paper⁵, however, the size of hail is in a great majority of cases, either referred to as equal to that of objects like "plum", "betel nut", "lemor", "potato", "apple", "orange", "eggs" (hen's, duck's, dove's, pigeon's, etc.) "tennis balls", "large mango", "cocoanut", etc. or is expressed in terms of the diameter or the circumference of the hailstone. These accounts indicate that spherical or approximately spherical is the common form of hailstone in India. In a few cases only, the size of the hailstones has been described in a different way, e.g. as "½ square inch", "2 square inches", "1½ inches cube", "size of a pice", "large ice flakes", etc. There are also a good number of cases where no other description excepting the weight of the stone is given; it is possible that in these cases the form of the hailstones was not spherical. The speculation that "jagged and irregular stones would do the most damage" seems very probable. There are a few destructive hailstorms on record during which "large ice flakes"* fell and caused considerable loss of life and property. At the same time, there are many cases on record where stones reported to be spherical, resulted in the greatest devastation possible.

The present writer had himself opportunities in recent years to observe closely the shapes of hailstones during falls of hail at his native place in the Moradabad District. On most of these occasions the hailstones were observed to be approximately spherical in shape; on a few occasions they were also found to have an almost flat circular form or the shape of a double convex lens. On one occasion during January, 1941, a few hailstones only in a large collection made during a rapid shower of hail were found to have rather an uncommon form—more or less resembling in shape a round-headed nail 1" to 1½" in length and ¼" in diameter, the size of the head being ½" to ¾" in diameter; the shower lasted only for about 15 minutes and no damage was done.

* A remarkable example is that of the storm which visited Purandhar Taluka (Bombay Presidency) on the 11th December, 1854.

Risk to agriculture from hail.

The frequency of days with hailstorms in India has been discussed by Ramdas¹⁴ and his associates and they have come to the conclusion that "the phenomenon of hail should be regarded as a risk to agriculture, to which the methods of insurance may be applied for safeguarding the interests of the farmer by insuring his crops against hail-damage". It is high time that India takes active steps to devise suitable insurance plans on the lines of some European countries and certain parts of the U.S.A. and Canada, where the business of hail-insurance is conducted by the Government.

Need for more systematic observations.

The system of collection of hailstorm reports at present in vogue in India has no doubt afforded useful information but the data obtained are rather more of a *qualitative* nature. With a view to collect more reliable and *quantitative* data, it is suggested that a scheme of systematic observations of hail by the use of suitable hail-gauges at some selected stations where hailstorms are common, may be adopted in India. This scheme should also provide facilities for measuring, weighing and photographing hailstones whenever considered necessary.

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