

## **Results in healthy eyes, type 1, 2 and 3 diabetic retinopathy and possible glaucoma of the proposed methods using the 39 fundus diseases database used by Cen et al.**

For the results shown, we used fundus images from the database used by Ling-Ping Cen et al. (2021), in their work entitled Automatic detection of 39 fundus diseases and conditions in retinal photographs using Deep neural networks (the article is available at the following web address: <https://www.nature.com/articles/s41467-021-25138-w>).

The author describes in his article that the images were collected from 7 different sources, in which 249, 620 images were collected. The training dataset of 129, 264 images were collected from JSIEC ( $n = 74$ , 683 images), LEDRS ( $n = 27$ , 463 images) and EyePACS ( $n = 27$ , 118 images); in addition, external multi-hospital test data were collected, of which 3 hospitals in China: one in Fujian ( $n = 39$ , 671 images), one in Tibet ( $n = 14$ , 826 images) and the last one in Xinjiang ( $n = 5948$  images). In addition, four publicly available datasets were used: MESSIDOR-2 ( $n = 1748$  images), Indian Diabetic Retinopathy Image Data set IDRID ( $n = 516$  images), Pathological Myopia PALM ( $n = 374$  images) and Retinal Fundus Glaucoma challenge REFUGE ( $n = 800$  images). The dataset is available at the following link (<https://www.kaggle.com/datasets/linchundan/fundusimage1000>). Although the database is image-rich, it is difficult to identify with which camera the images were captured and to know the wavelength used.

## Healthy Eyes Results with the Optic Nerve on the Right Side ONR

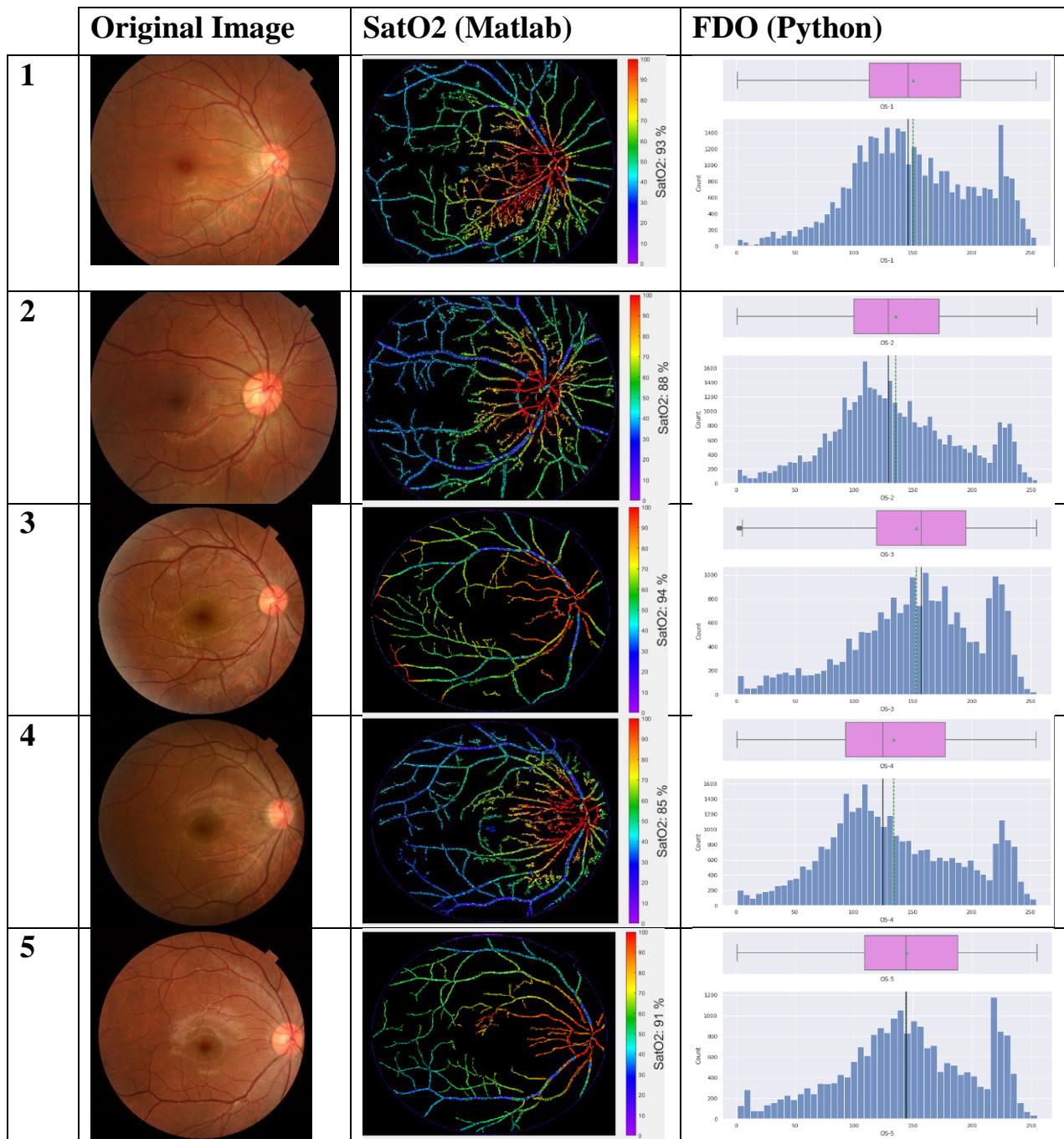
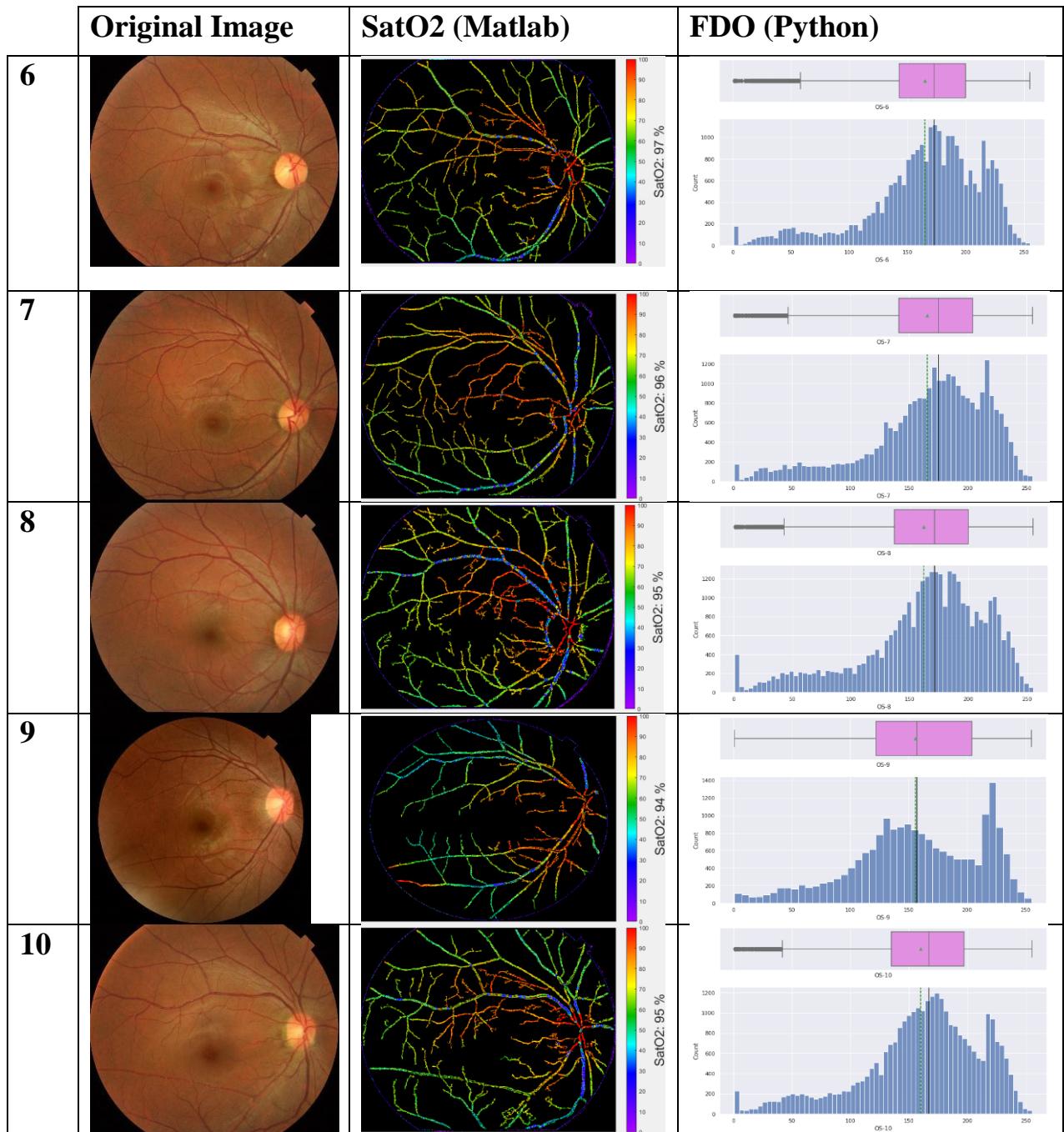


Table 1.1. Application of the pseudocolour method applied to patients HE-1 to HE-5 (Healthy Eye). In addition to the plot of the repetition of the values obtained from the vector of each image. It can be seen that in this bias the patient data yielded a mean oxygen saturation of 90.2%.



*Table 1.2. Application of the pseudocolour method applied to patients HE-6 to HE-10 (Healthy Eye). In addition to the plot of the repetition of the values obtained from the vector of each image. It can be seen that in this bias the patient data yielded a mean oxygen saturation of 95.4%.*

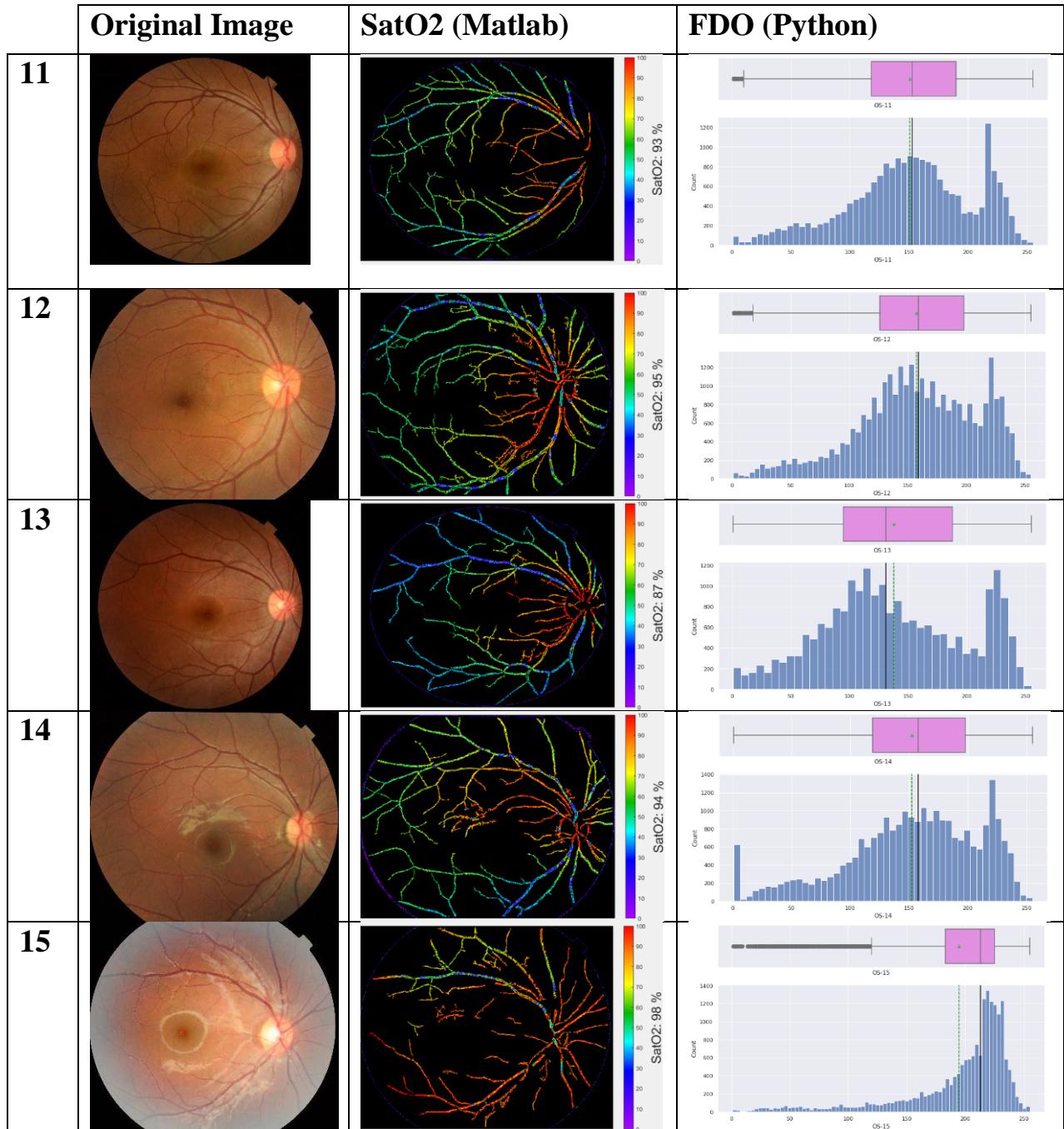
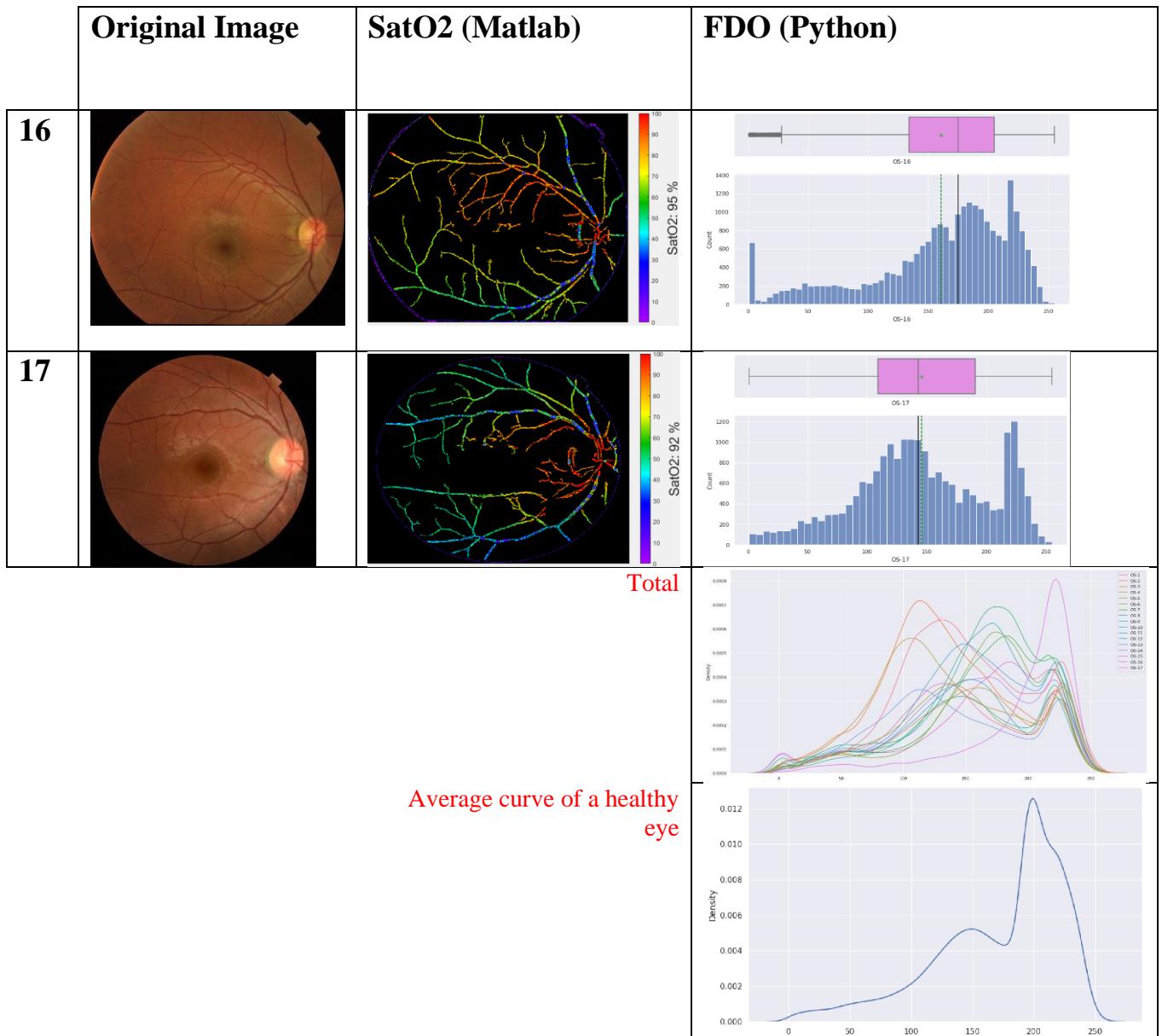


Table 1.3. Application of the pseudocolour method applied to patients HE-11 to HE-15 (Healthy Eye). In addition to the plot of the repetition of the values obtained from the vector of each image. It can be seen that in this bias the patient data yielded a mean oxygen saturation of 92.8%.



Average curve of a healthy eye

*Table 1.4. Application of the pseudocolour method applied to patients HE-16 to HE-17 (Healthy Eye). In addition to the plot of the repetition of the values obtained from the vector of each image. Also shown is the distribution curve of values of the existing fundus images from 1.1 to 1.4 and the characterisation curve for this condition (oximetric distribution function). It is noted that in this bias the patient data yielded a mean oxygen saturation of 93.5%.*

## Healthy Eyes Results with the Optic Nerve on the Centre ONC

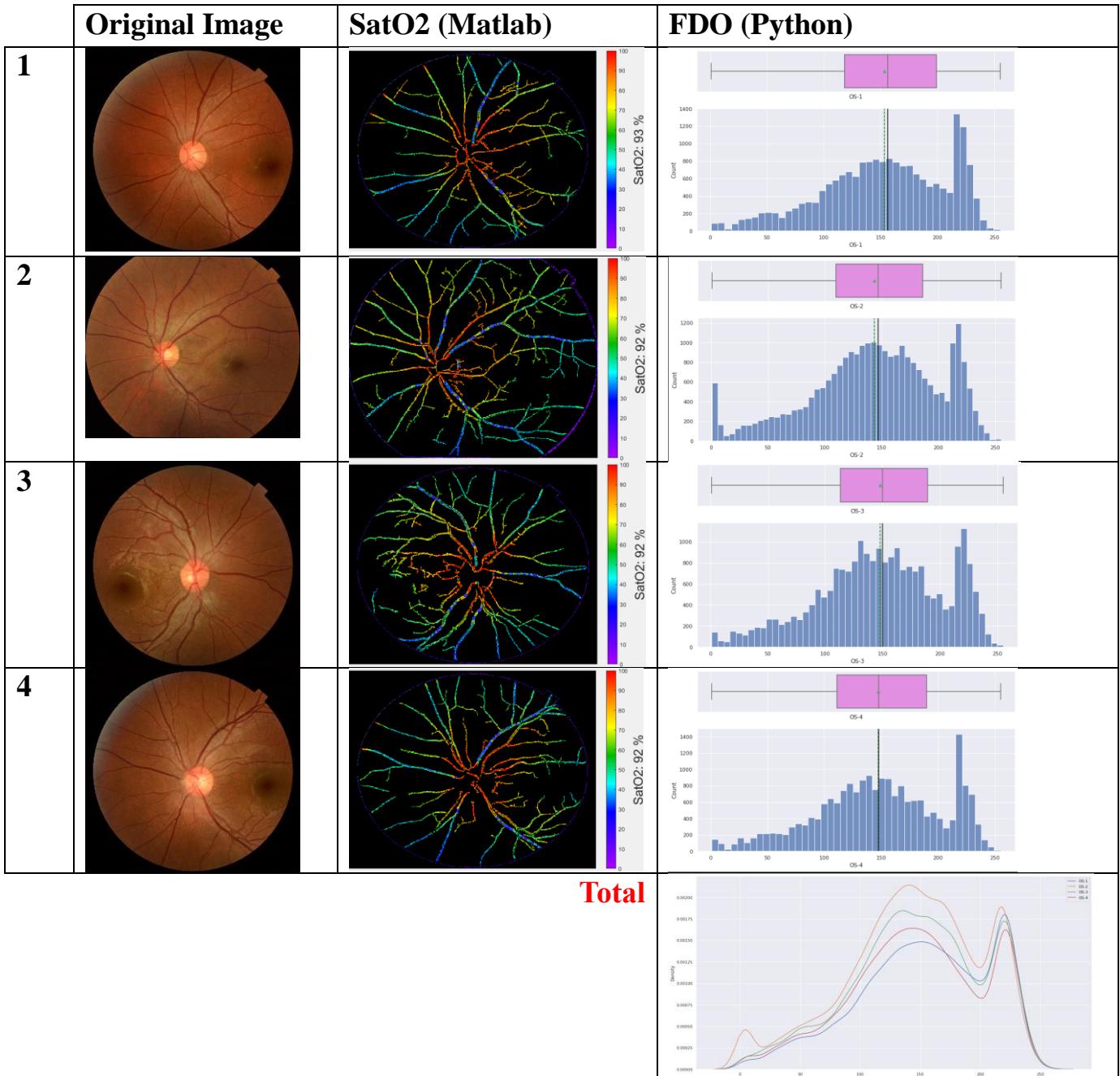


Table 2.1. Application of the pseudocolour method applied to patients HE-1 to HE-4 (Healthy Eye). In addition to the plot of the repetition of the values obtained from the vector of each image. The distribution curve of values of the existing fundus images is also shown. It is observed that in this bias the patient data yielded a mean oxygen saturation of 91.5%.

## Healthy Eyes Results with the Optic Nerve on the Left Side ONL

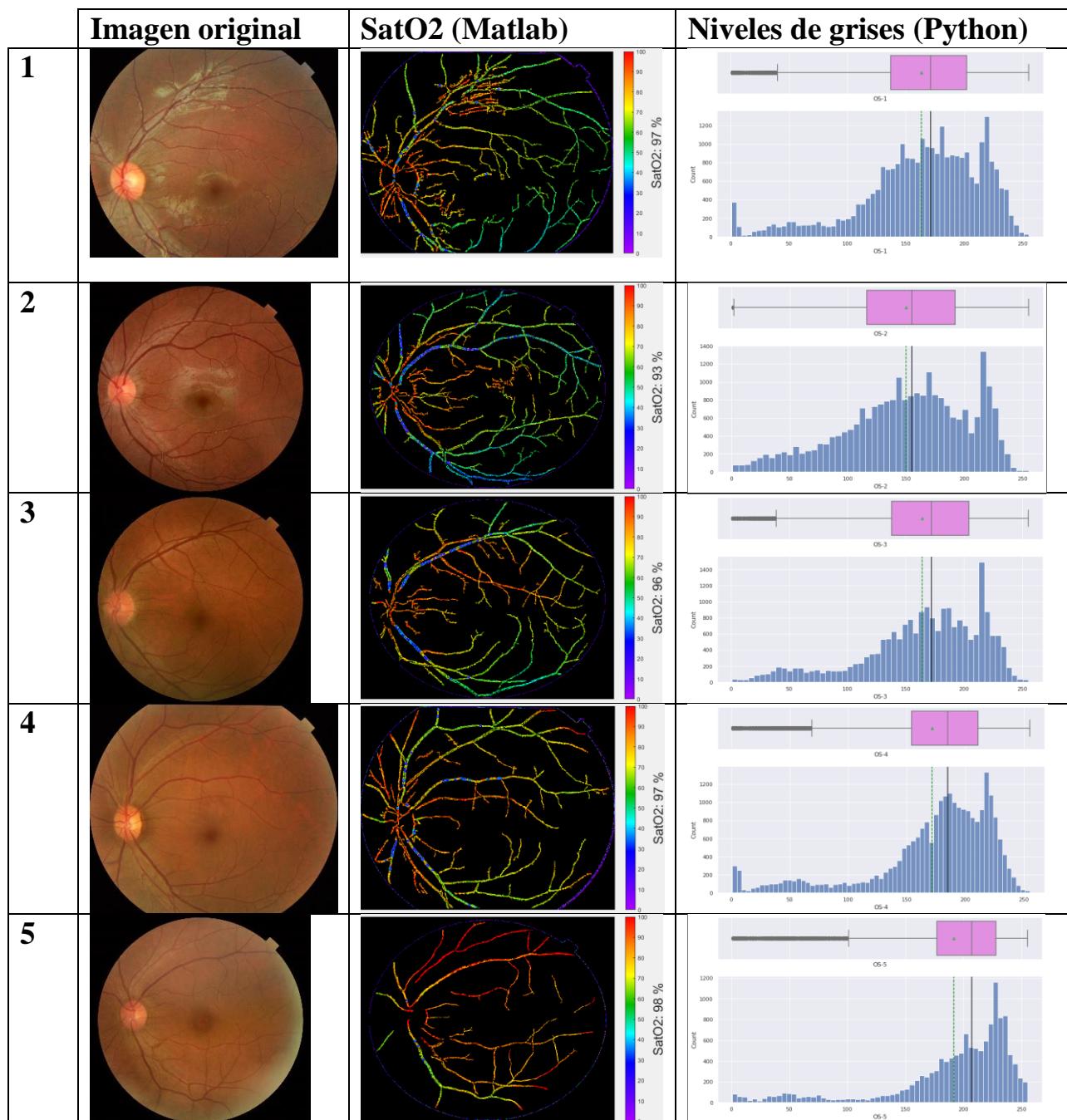
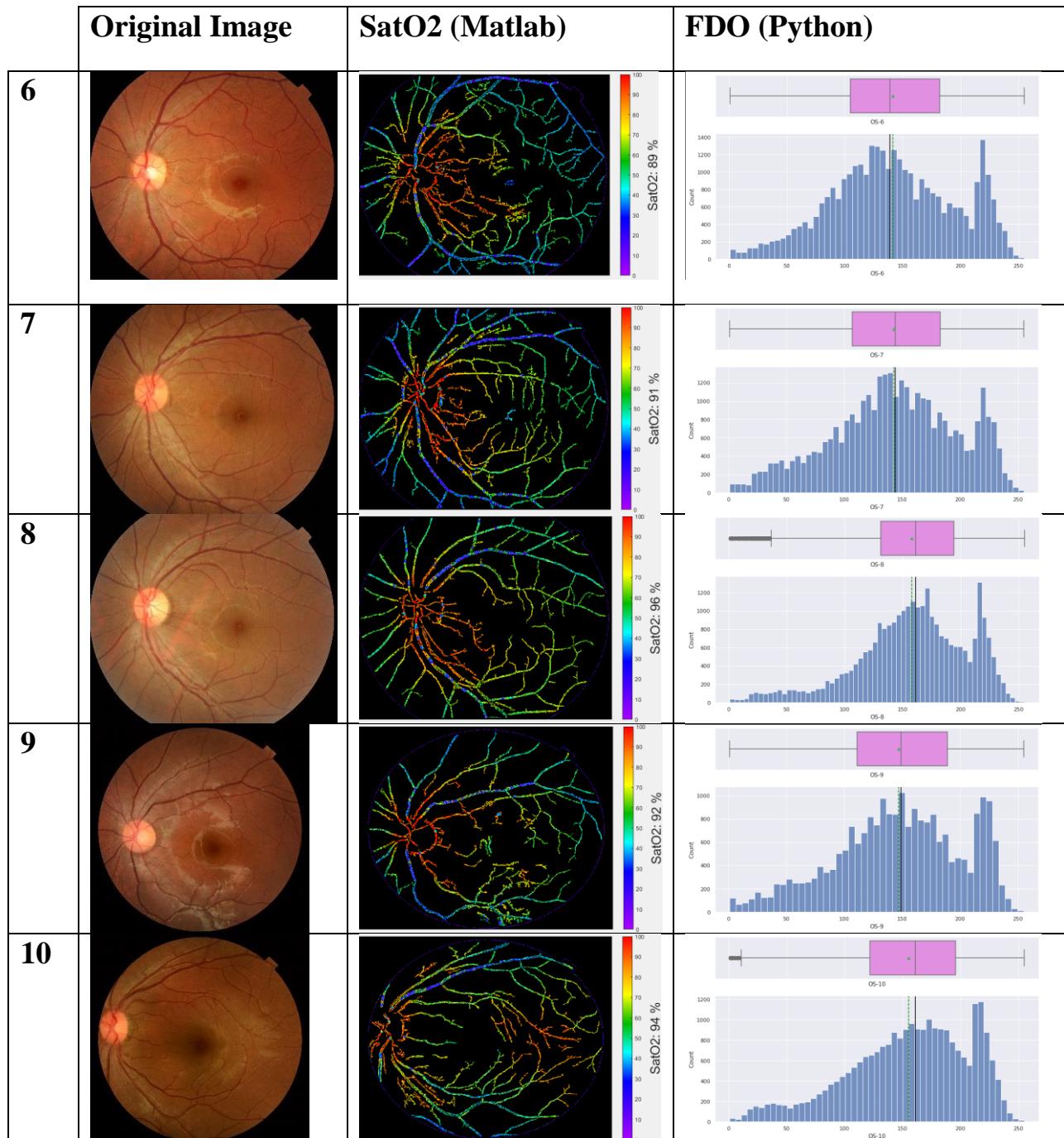
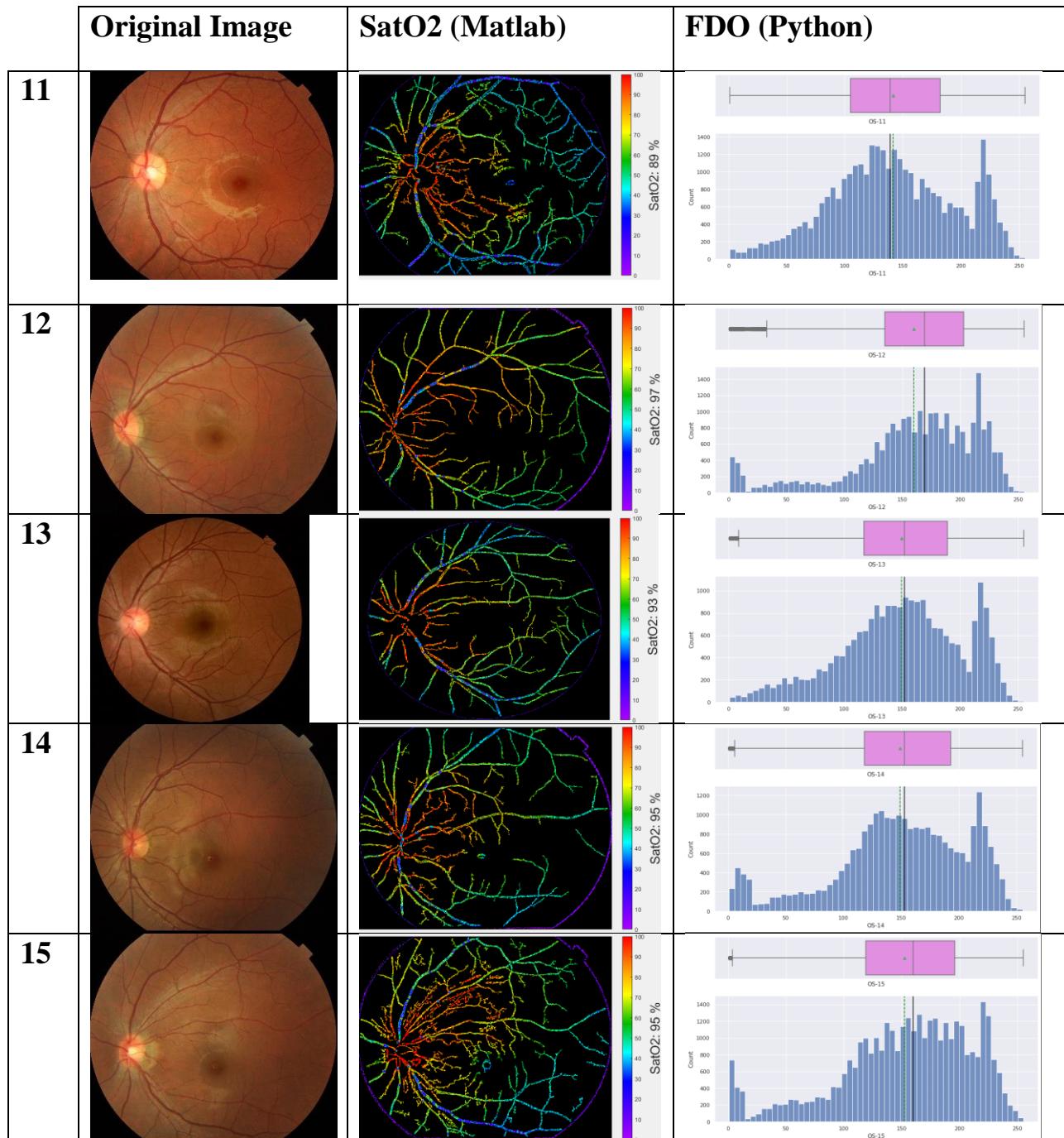


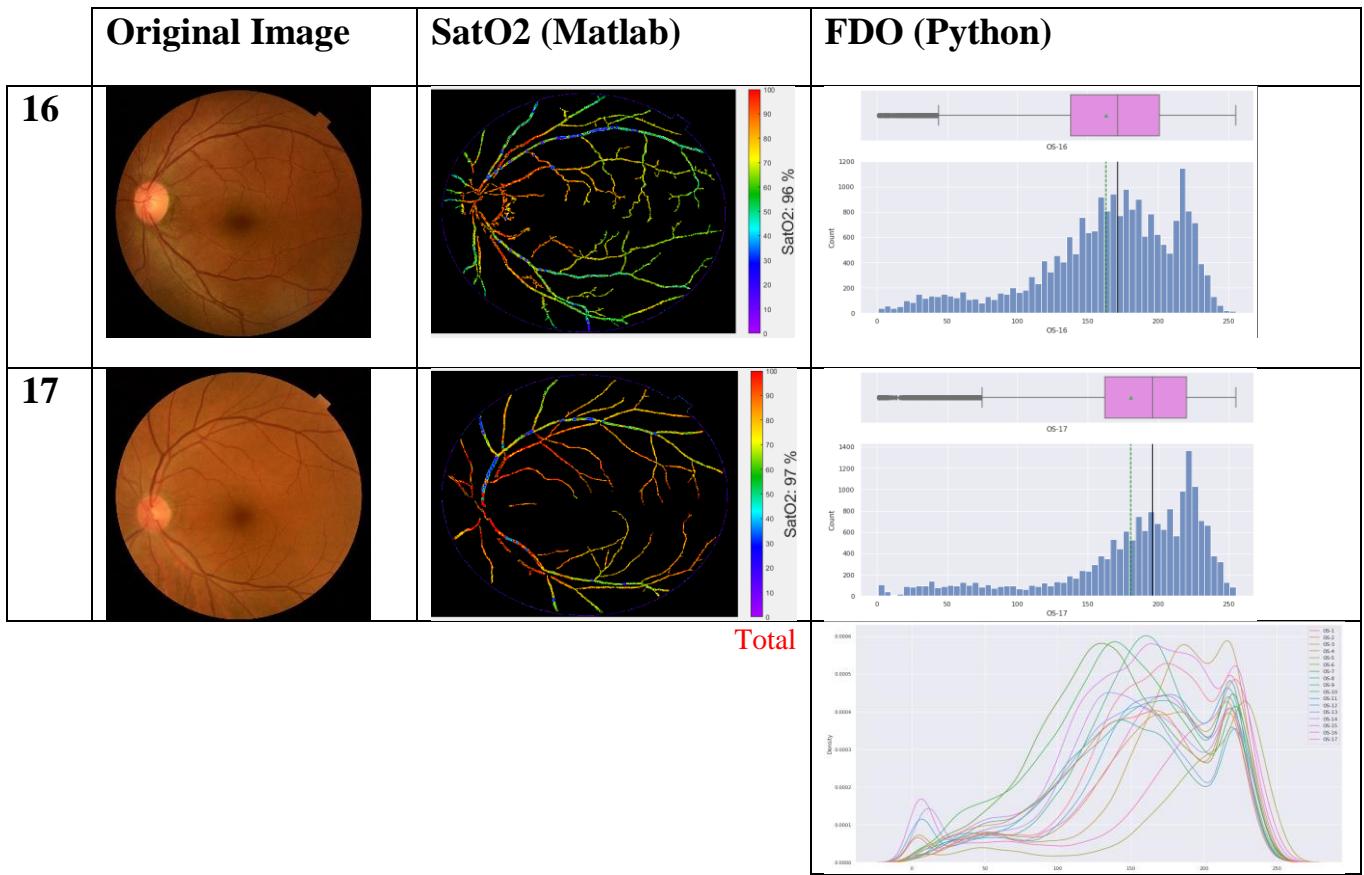
Table 3.1. Application of the pseudocolour method applied to patients HE-1 to HE-5 (Healthy Eye). In addition to the plot of the repetition of the values obtained from the vector of each image. It can be seen that in this bias the patient data yielded a mean oxygen saturation of 96.2%.



*Table 3.2. Application of the pseudocolour method applied to patients HE-6 to HE-10 (Healthy Eye). In addition to the plot of the repetition of the values obtained from the vector of each image. It can be seen that in this bias the patient data yielded a mean oxygen saturation of 92.4%.*



*Table 3.3. Application of the pseudocolour method applied to patients HE-10 to HE-15 (Healthy Eye). In addition to the plot of the repetition of the values obtained from the vector of each image. It can be seen that in this bias the patient data yielded a mean oxygen saturation of 93.8%.*



*Table 3.4. Application of the pseudocolour method applied to patients HE-16 to HE-17 (Healthy Eye). In addition to the plot of the repetition of the values obtained from the vector of each image. Also shown is the distribution curve of values of the existing fundus images from 3.1 to 3.4 and the characterisation curve for this condition (oximetric distribution function). It is noted that in this bias the patient data yielded a mean oxygen saturation of 96.5%.*

## Results of Type1 Diabetic Retinopathy with the Optic Nerve on the Right Side ONR

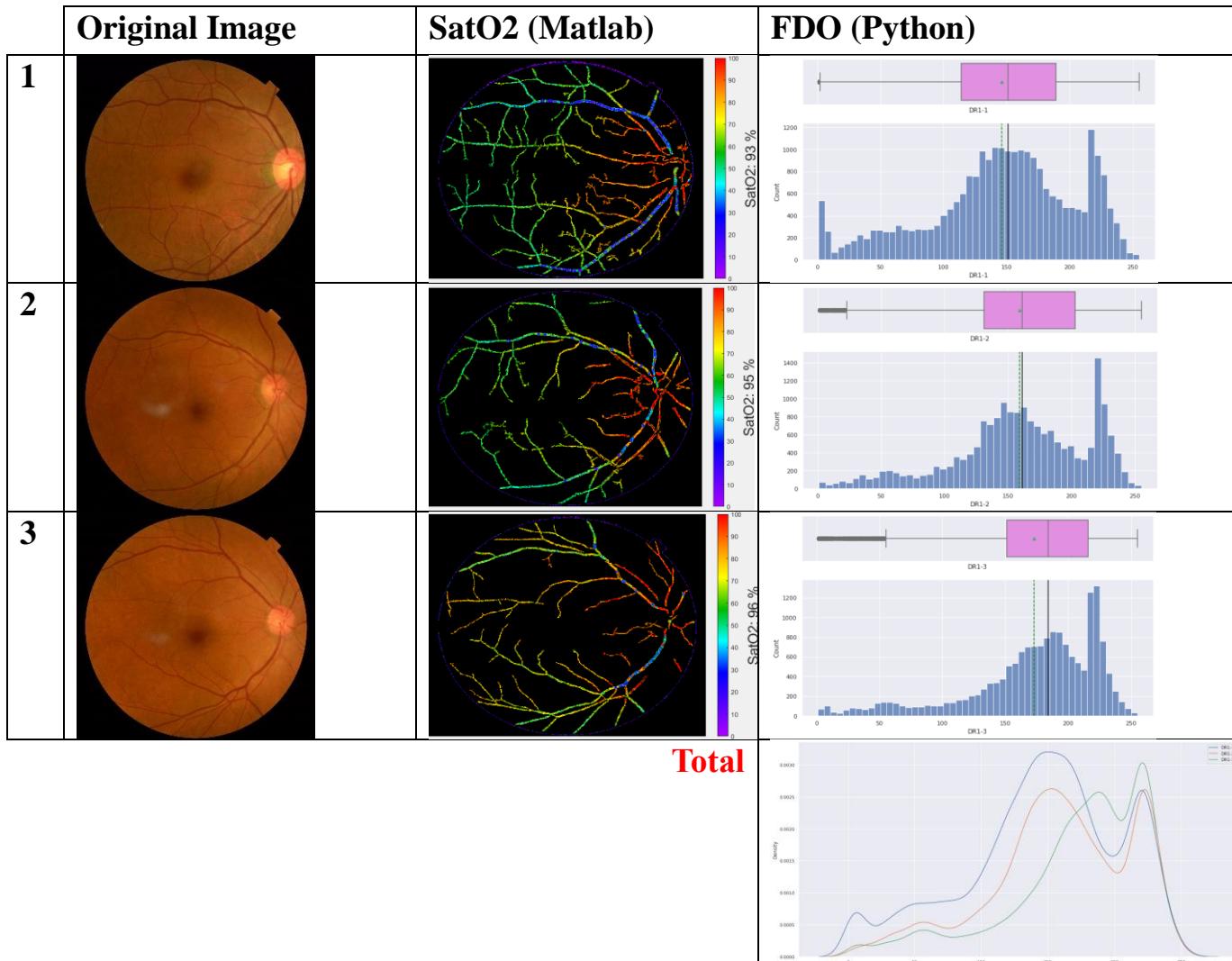


Table 4.1. Application of the pseudocolour method applied to patients DR1-1 to DR1-3 (Diabetic Retinopathy Type 1). In addition to the plot of the repetition of the values obtained from the vector of each image. The distribution curve of values of the existing fundus images is also shown.

## Results of Type 1 Diabetic Retinopathy with the Optic Nerve on the Centre ONC

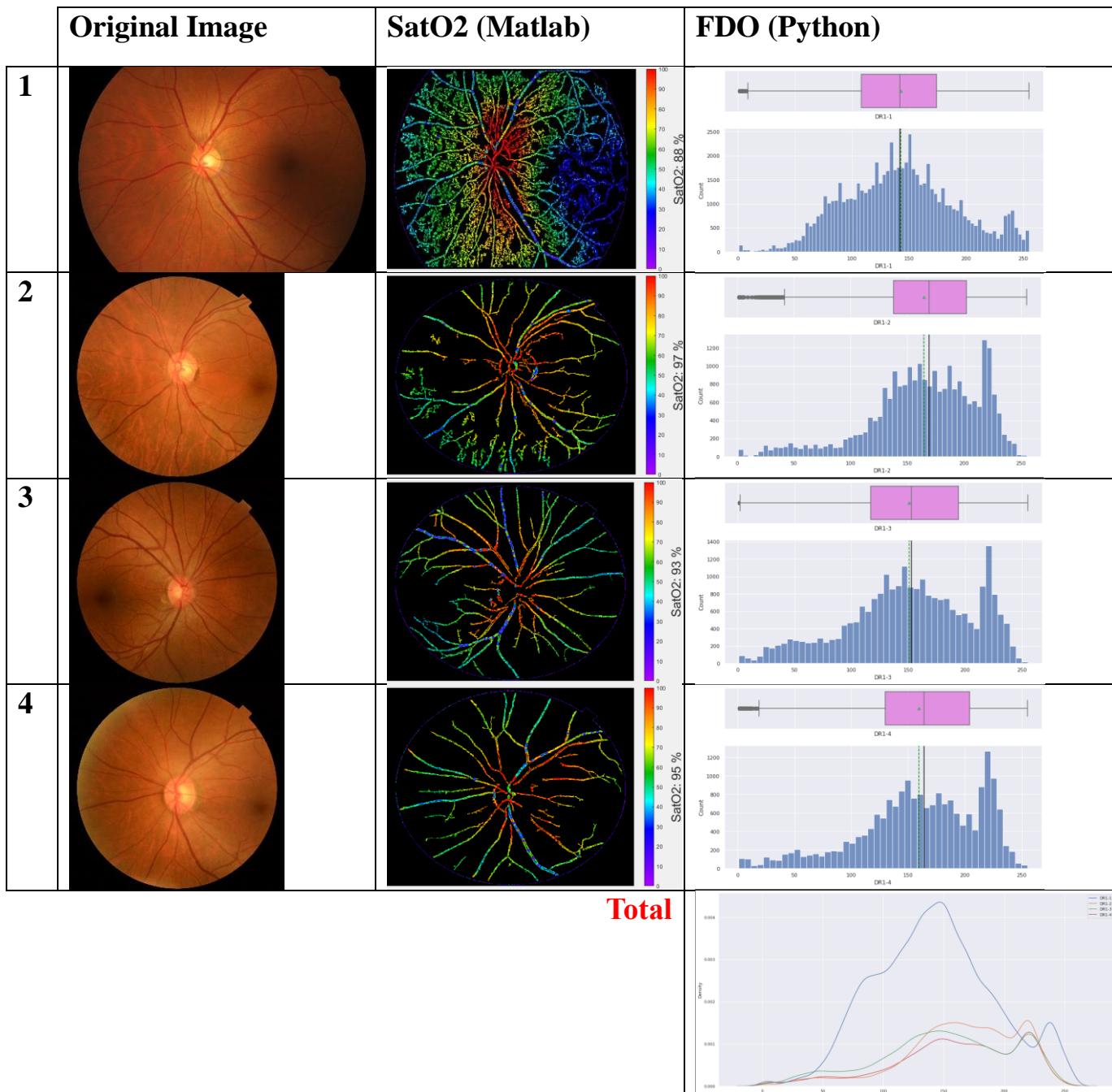
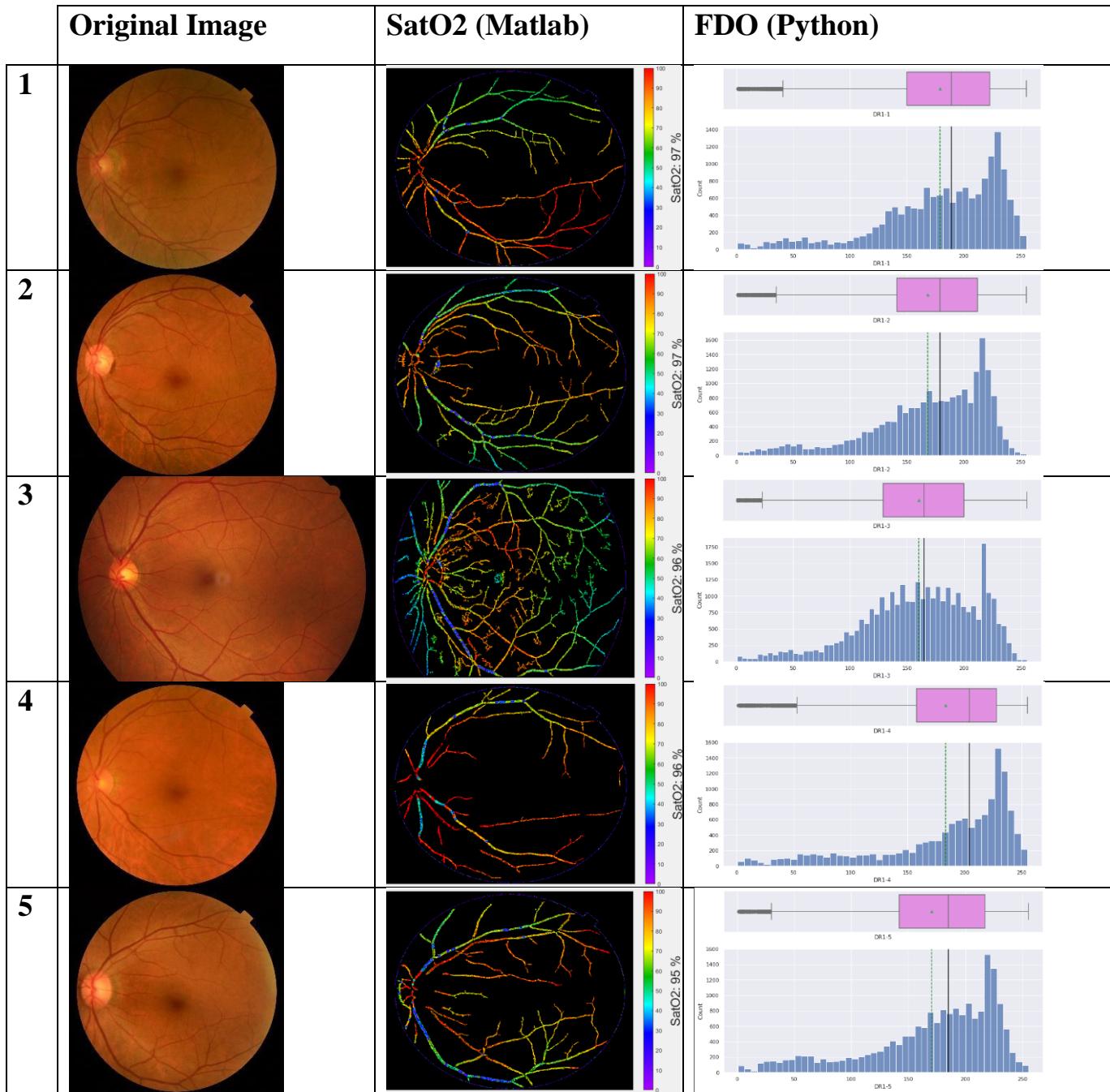


Table 4.2. Application of the pseudocolour method applied to patients DR1-1 to DR1-4 (Diabetic Retinopathy Type 1). In addition to the plot of the repetition of the values obtained from the vector of each image. The distribution curve of values of the existing fundus images is also shown.

## Results of Type 1 Diabetic Retinopathy with the Optic Nerve on the Left Side ONR



*Table 4.3. Application of the pseudocolour method applied to patients DR1-1 to DR1-5 (Diabetic Retinopathy Type 1). In addition to the plot of the repetition of the values obtained from the vector of each image. It is observed that in this bias the patient data yielded a mean oxygen saturation of 96.2%.*

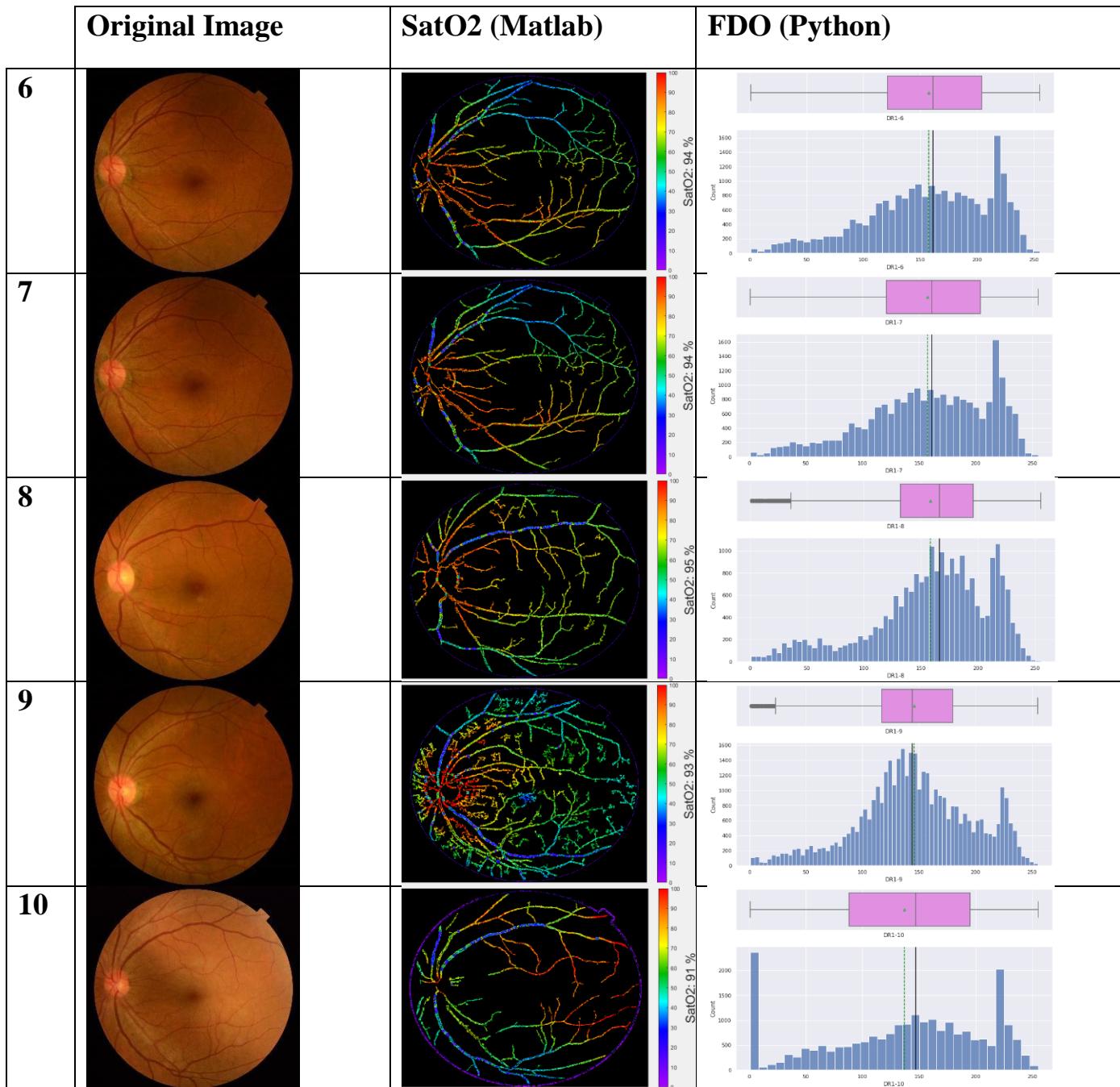
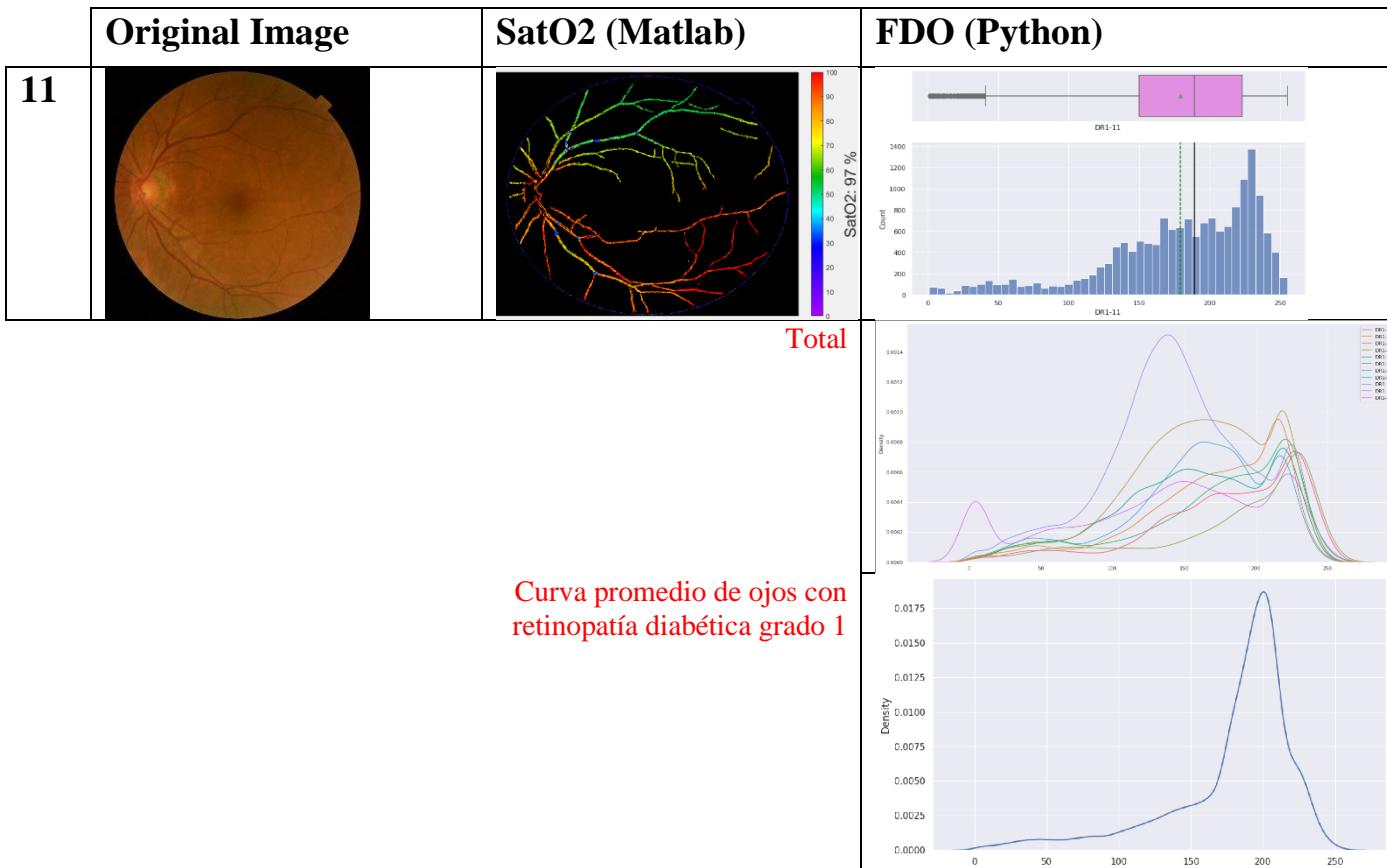


Table 4.4. Application of the pseudocolour method applied to patients DR1-6 to DR1-10 (Diabetic Retinopathy Type 1). In addition to the plot of the repetition of the values obtained from the vector of each image. It is observed that in this bias the patient data yielded a mean oxygen saturation of 93.4%.



*Table 4.5. Application of the pseudocolour method applied to DR1-11 (Diabetic Retinopathy Type 1) patients. In addition to the plot of the repetition of the values obtained from the vector of each image. Also shown is the distribution curve of values of the existing fundus images from 4.3 to 4.5 and the characterisation curve for this condition (oximetric distribution function).*

## Results of Type 2 Diabetic Retinopathy with the Optic Nerve on the Right Side ONR

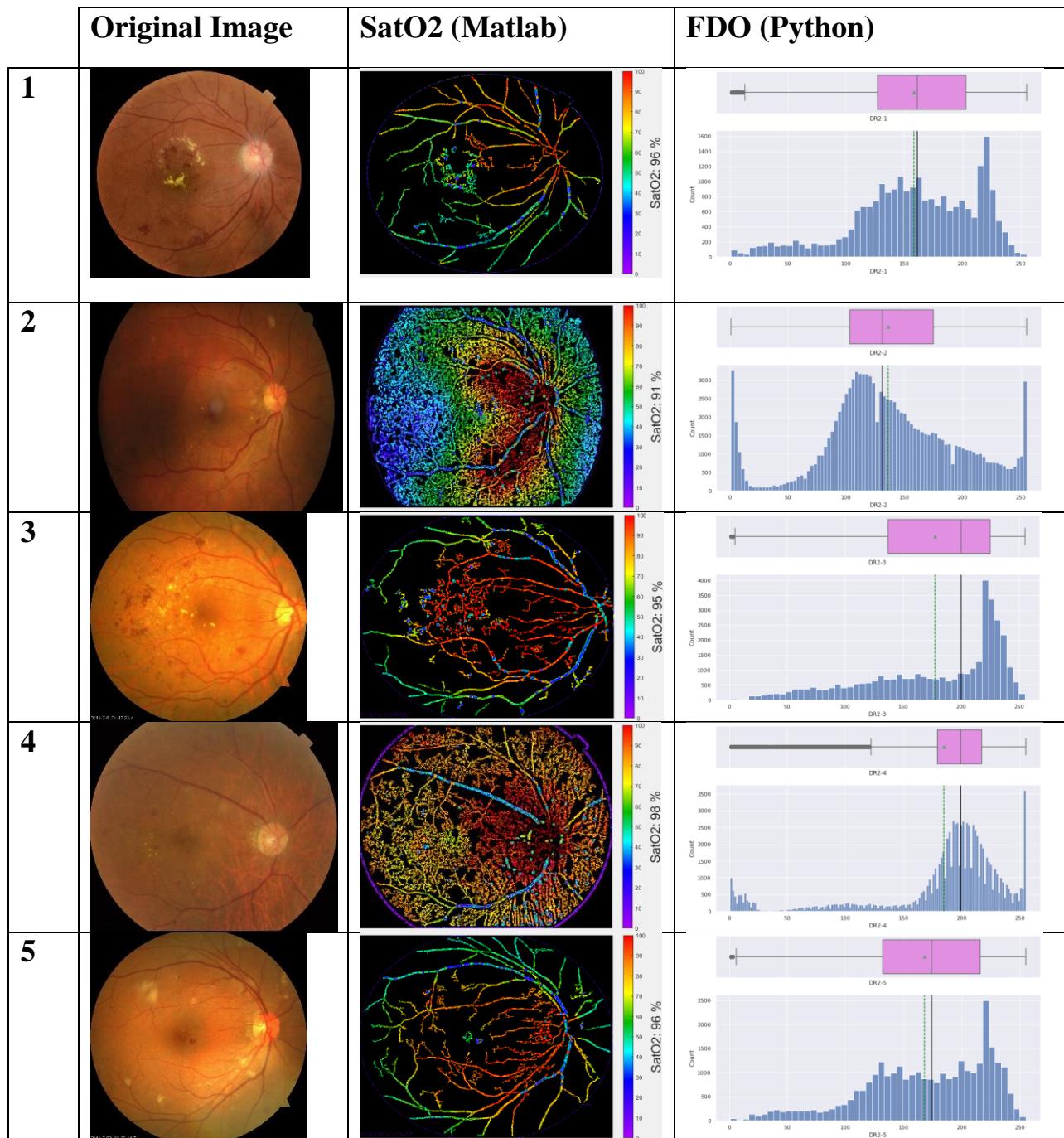
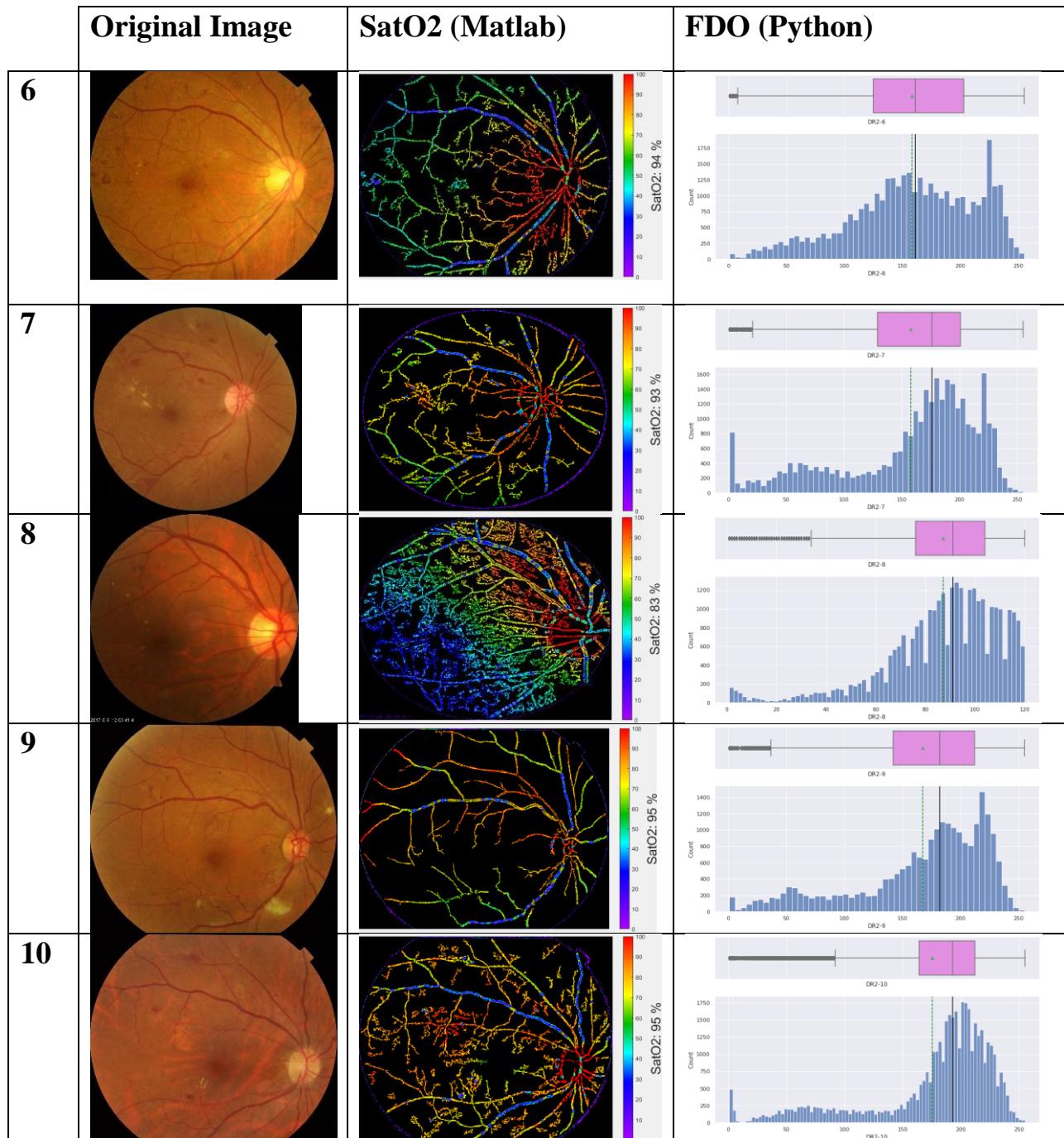


Table 5.1. Application of the pseudocolour method applied to patients DR2-1 to DR2-5 (Diabetic Retinopathy Type 2). In addition to the plot of the repetition of the values obtained from the vector of each image. It is observed that in this bias the patient data yielded a mean oxygen saturation of 95.2%.



*Table 5.2. Application of the pseudocolour method applied to patients DR2-6 to DR2-10 (Diabetic Retinopathy Type 2). In addition to the plot of the repetition of the values obtained from the vector of each image. It is observed that in this bias the patient data yielded a mean oxygen saturation of 92%.*

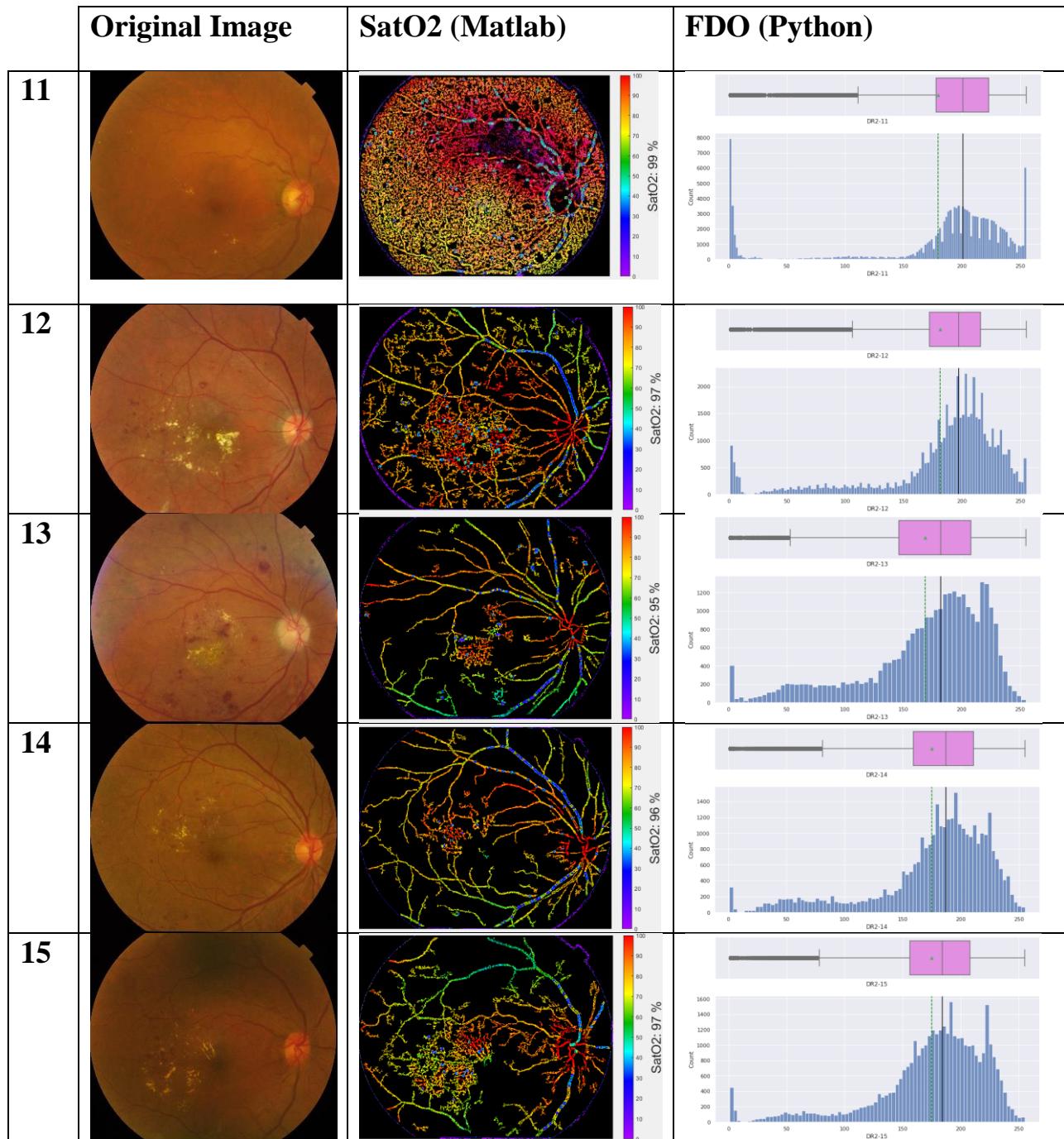


Table 5.3. Application of the pseudocolour method applied to patients DR2-11 to DR2-16 (Diabetic Retinopathy Type 2). In addition to the plot of the repetition of the values obtained from the vector of each image. It is observed that in this bias the patient data yielded a mean oxygen saturation of 96.8%.

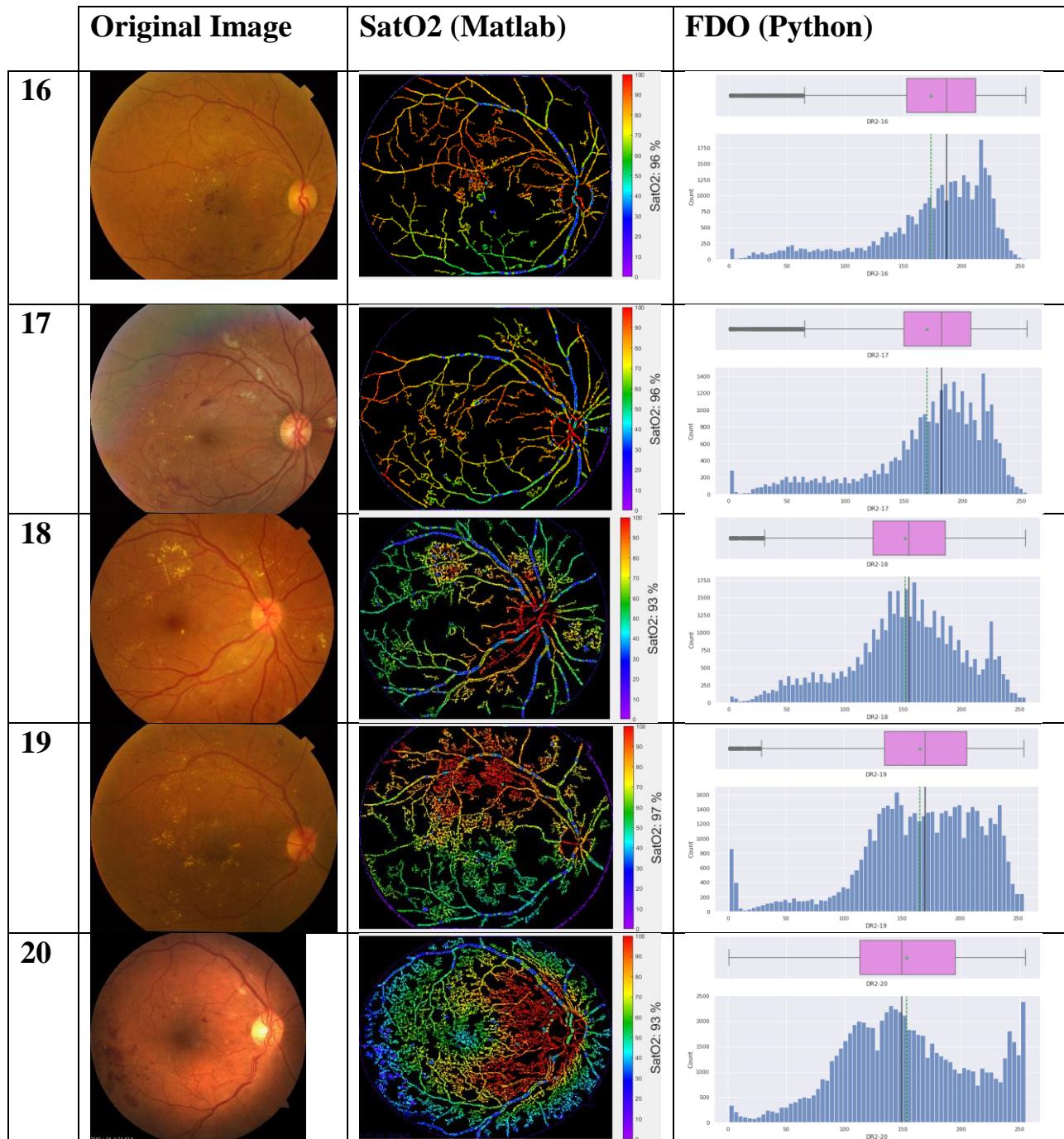


Table 5.4. Application of the pseudocolour method applied to patients DR2-16 to DR2-20 (Diabetic Retinopathy Type 2). In addition to the plot of the repetition of the values obtained from the vector of each image. It is observed that in this bias the patient data yielded a mean oxygen saturation of 95%.

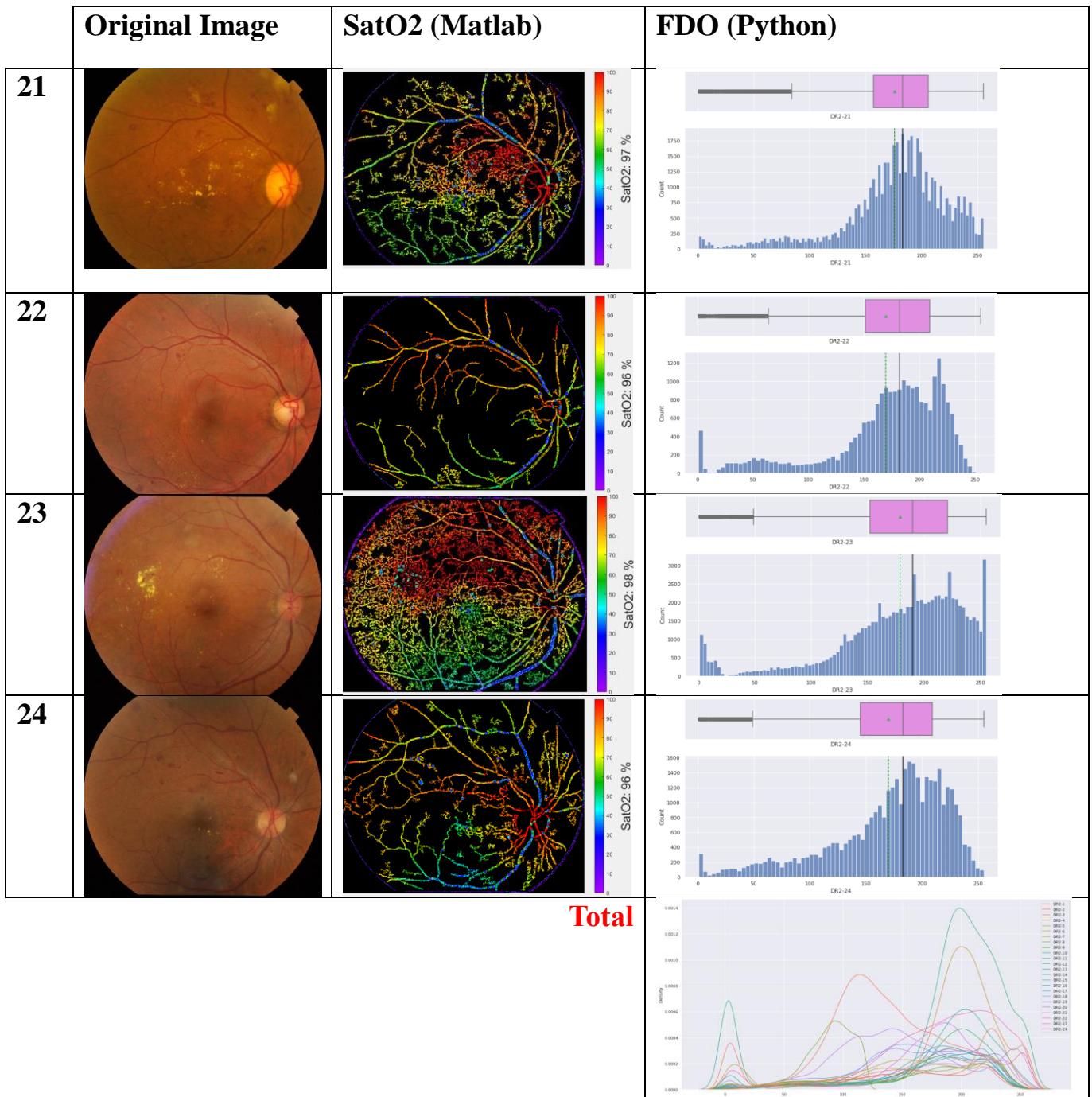


Table 5.5. Application of the pseudocolour method applied to DR2-11 (Diabetic Retinopathy Type 2) patients. In addition to the plot of the repetition of the values obtained from the vector of each image. Also shown is the distribution curve of values of the existing fundus images from 5.1 to 5.5. It is observed that in this bias the patient data yielded a mean oxygen saturation of 96.7%.

## Results of Type 2 Diabetic Retinopathy with the Optic Nerve on the Centre ONC

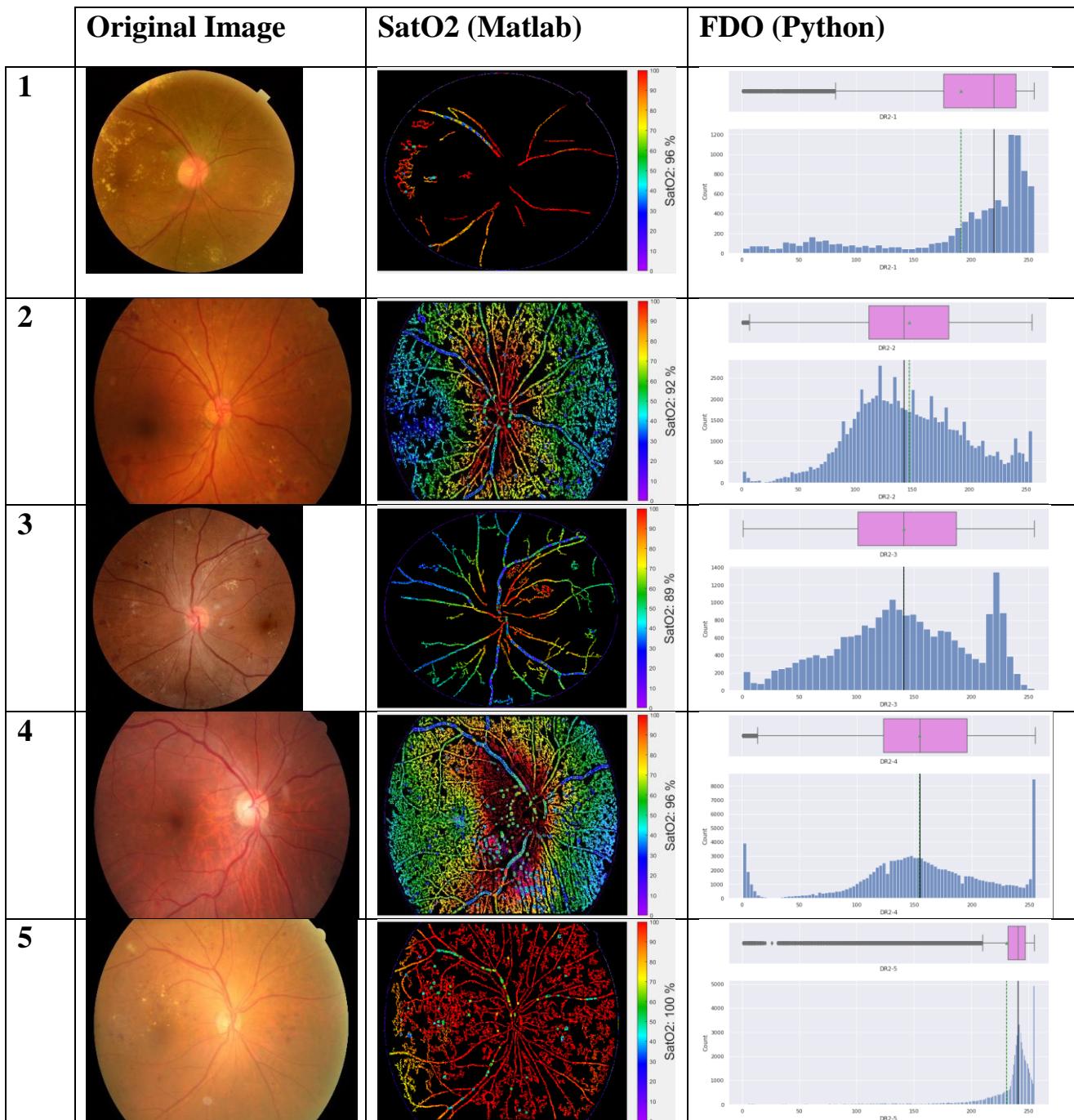
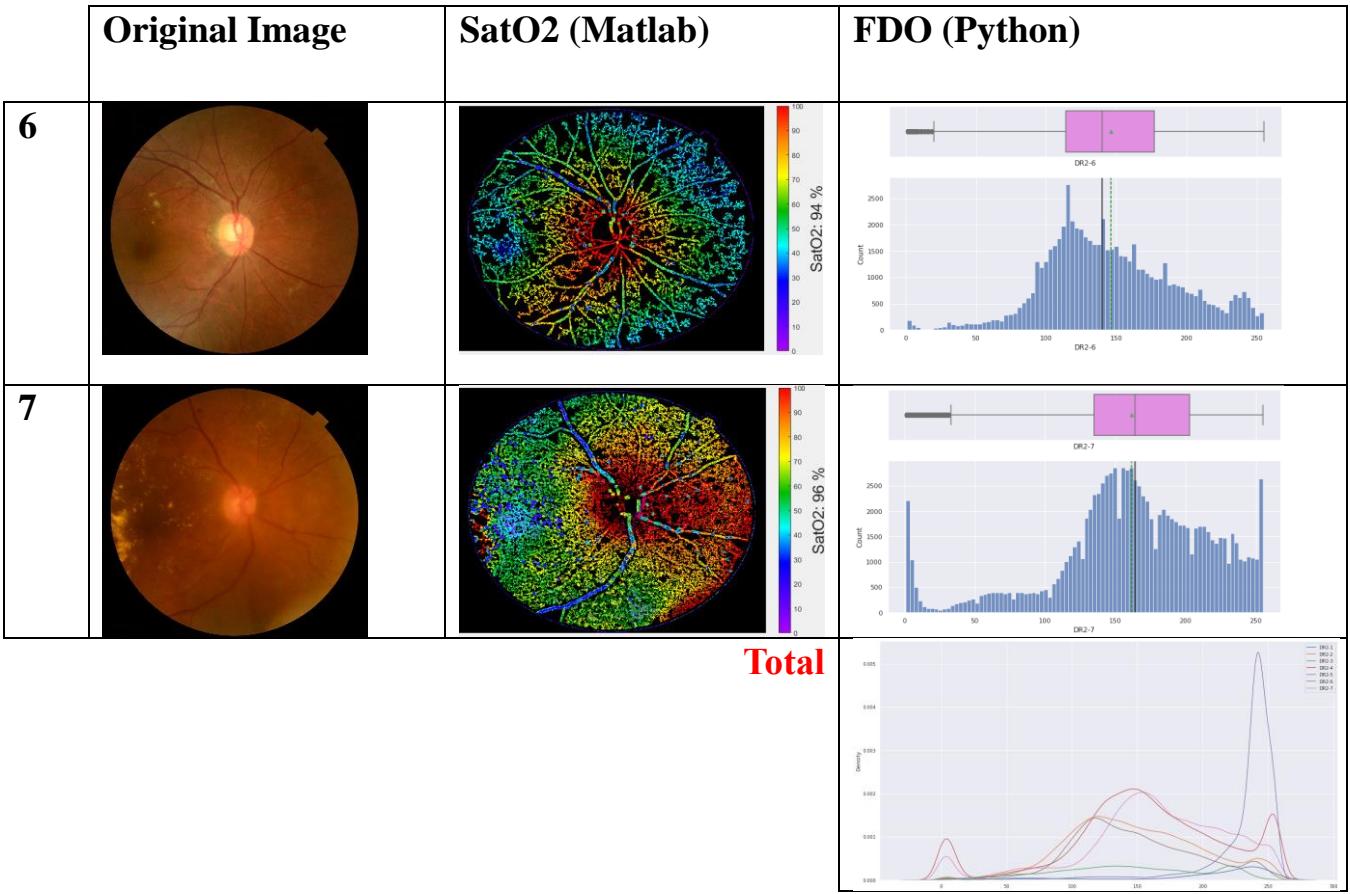


Table 5.6. Application of the pseudocolour method applied to patients DR2-1 to DR2-5 (Diabetic Retinopathy Type 2). In addition to the plot of the repetition of the values obtained from the vector of each image. It is observed that in this bias the patient data yielded a mean oxygen saturation of 94.6%.



*Table 5.7. Application of the pseudocolour method applied to patients DR2-6 to DR2-7 (Diabetic Retinopathy Type 2). In addition to the plot of the repetition of the values obtained from the vector of each image. Also shown is the distribution curve of values of the existing fundus images from 5.5 to 5.7. It is observed that in this bias the patient data yielded a mean oxygen saturation of 95%.*

## Results of Type 2 Diabetic Retinopathy with the Optic Nerve on the Left Side ONL

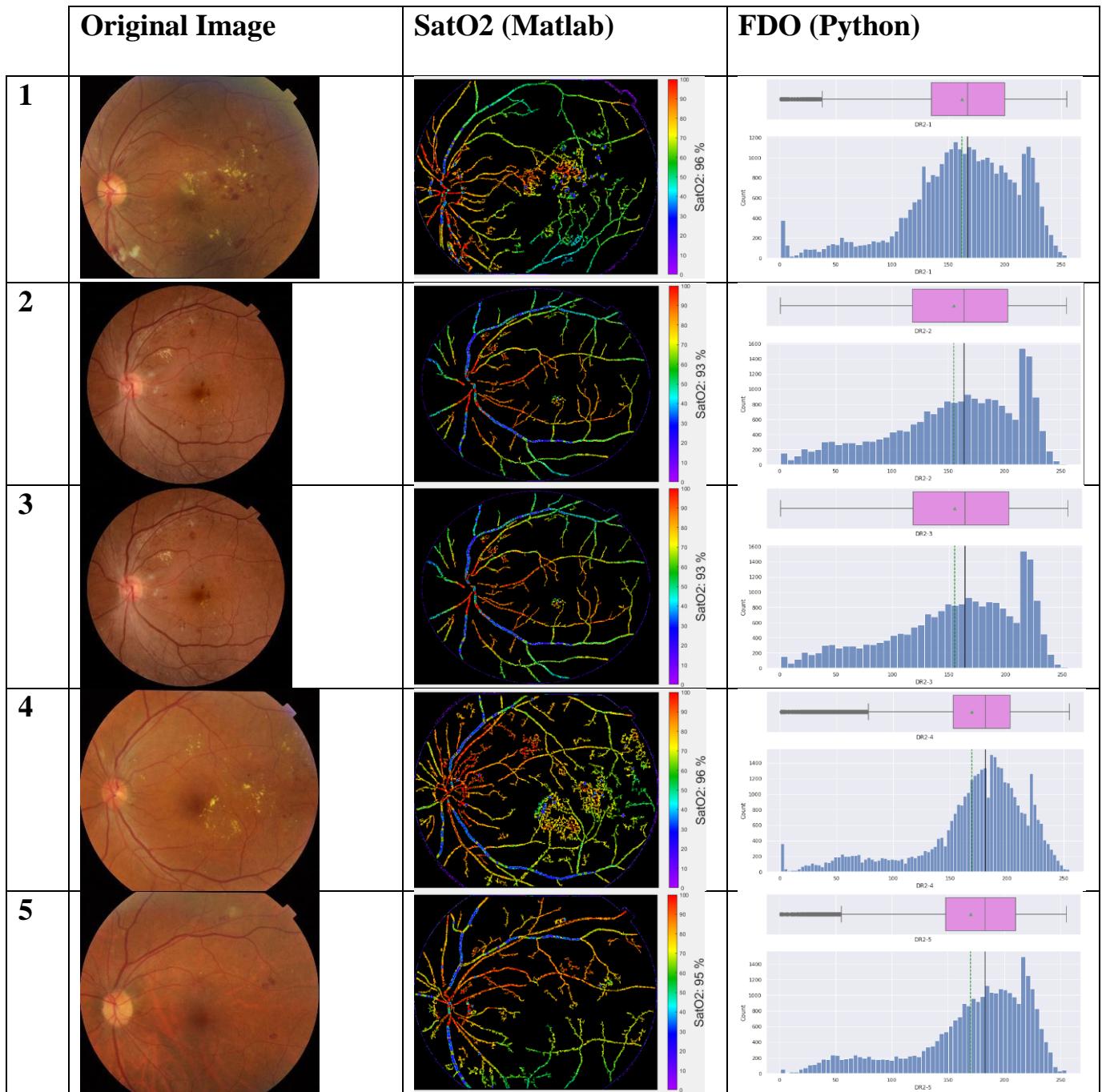


Table 5.8. Application of the pseudocolour method applied to patients DR2-1 to DR2-5 (Diabetic Retinopathy Type 2). In addition to the plot of the repetition of the values obtained from the vector of each image. It is observed that in this bias the patient data yielded a mean oxygen saturation of 94.6%.

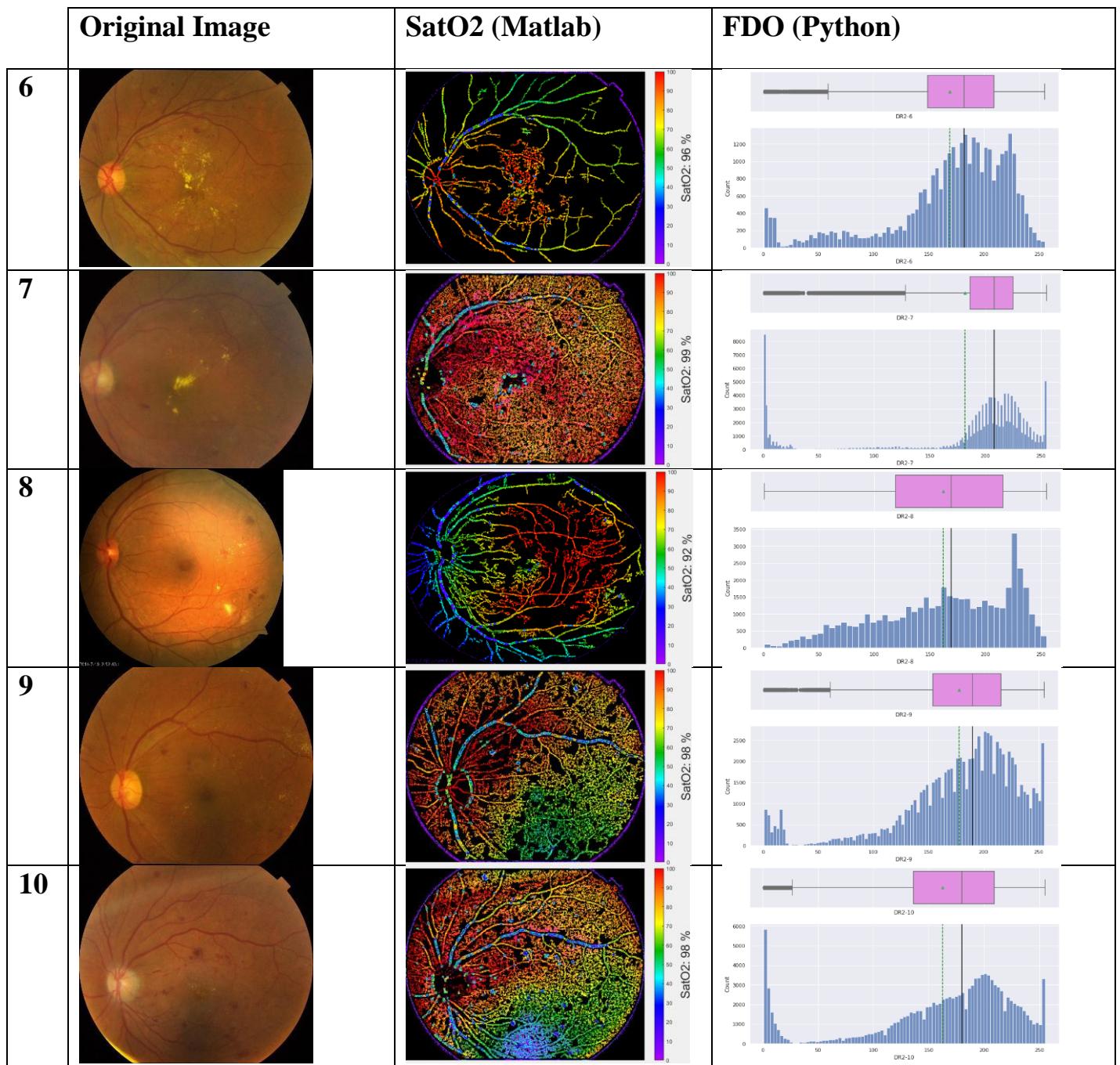


Table 5.9. Application of the pseudocolour method applied to patients DR2-6 to DR2-10 (Diabetic Retinopathy Type 2). In addition to the plot of the repetition of the values obtained from the vector of each image. It is observed that in this bias the patient data yielded a mean oxygen saturation of 96.6%.

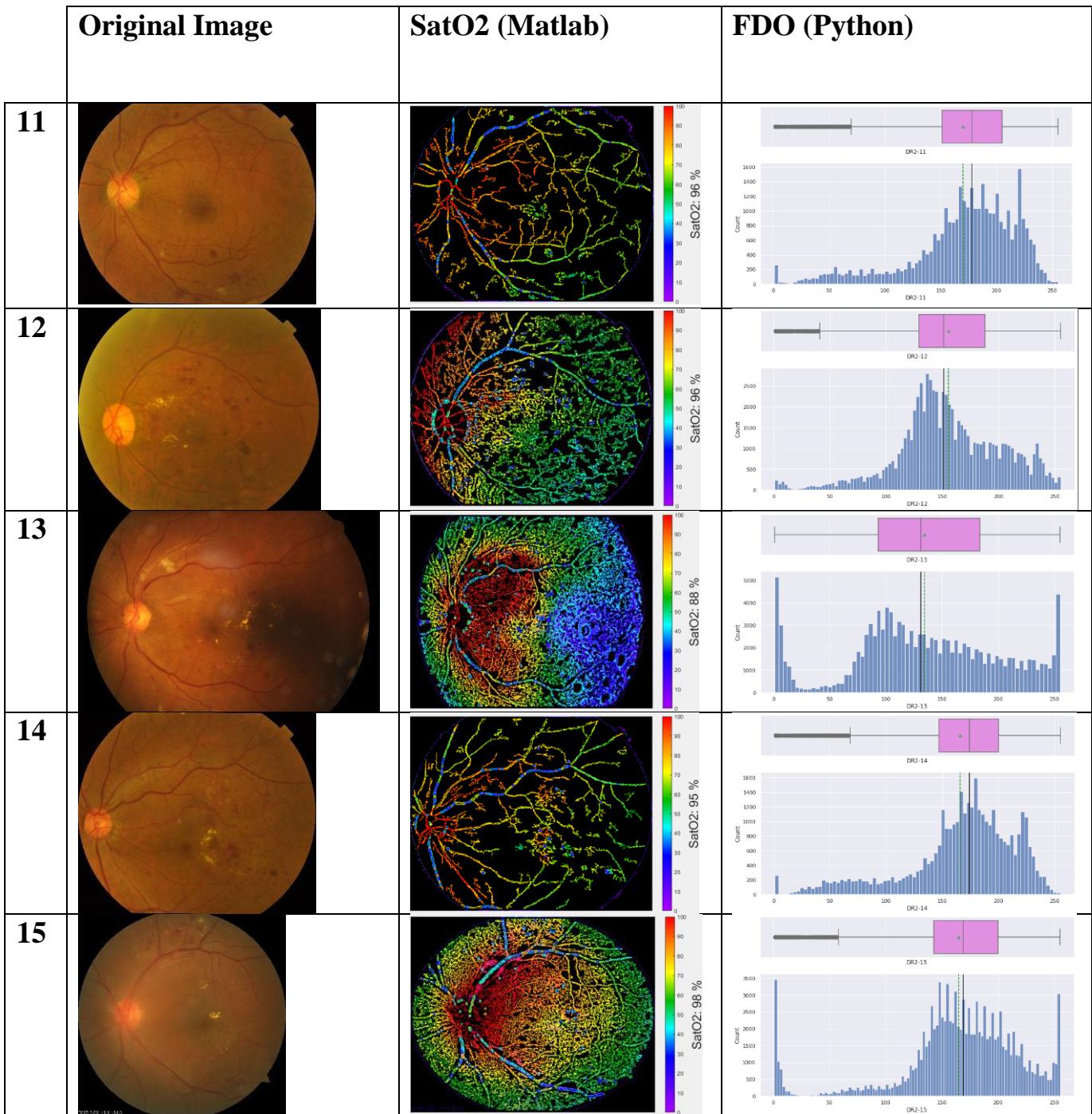


Table 5.10. Application of the pseudocolour method applied to patients DR2-11 to DR2-15 (Diabetic Retinopathy Type 2). In addition to the plot of the repetition of the values obtained from the vector of each image. It is observed that in this bias the patient data yielded a mean oxygen saturation of 94.6%.

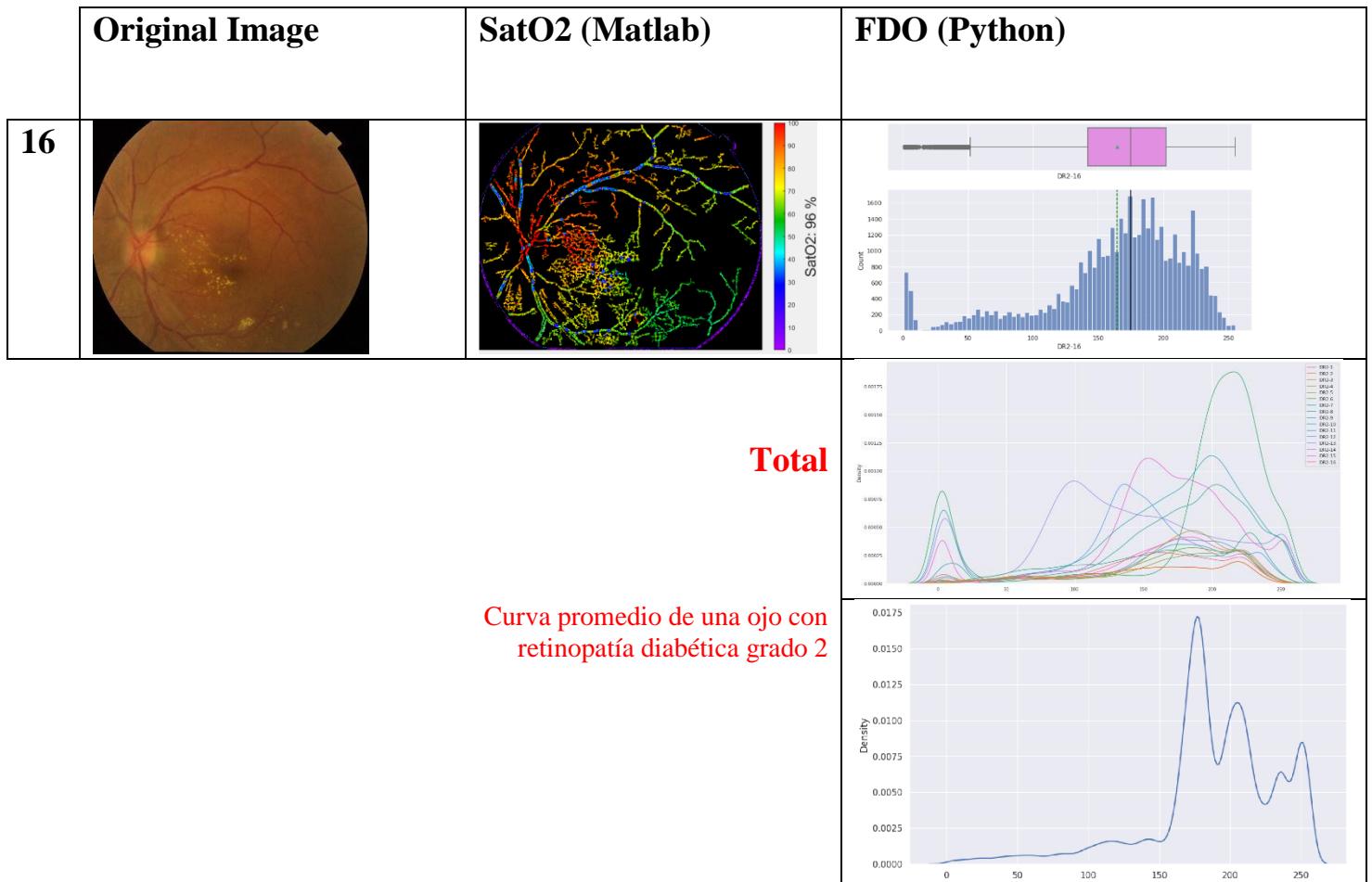


Table 5.11. Application of the pseudocolour method applied to DR1-16 (Diabetic Retinopathy Type 2) patients. In addition to the plot of the repetition of the values obtained from the vector of each image. Also shown is the distribution curve of values of the existing fundus images from 5.8 to 5.11. It can be seen that in this bias the patient data yielded a mean oxygen saturation of 96%.

## Results of Type 3 Diabetic Retinopathy with the Optic Nerve on the Right Side ONR

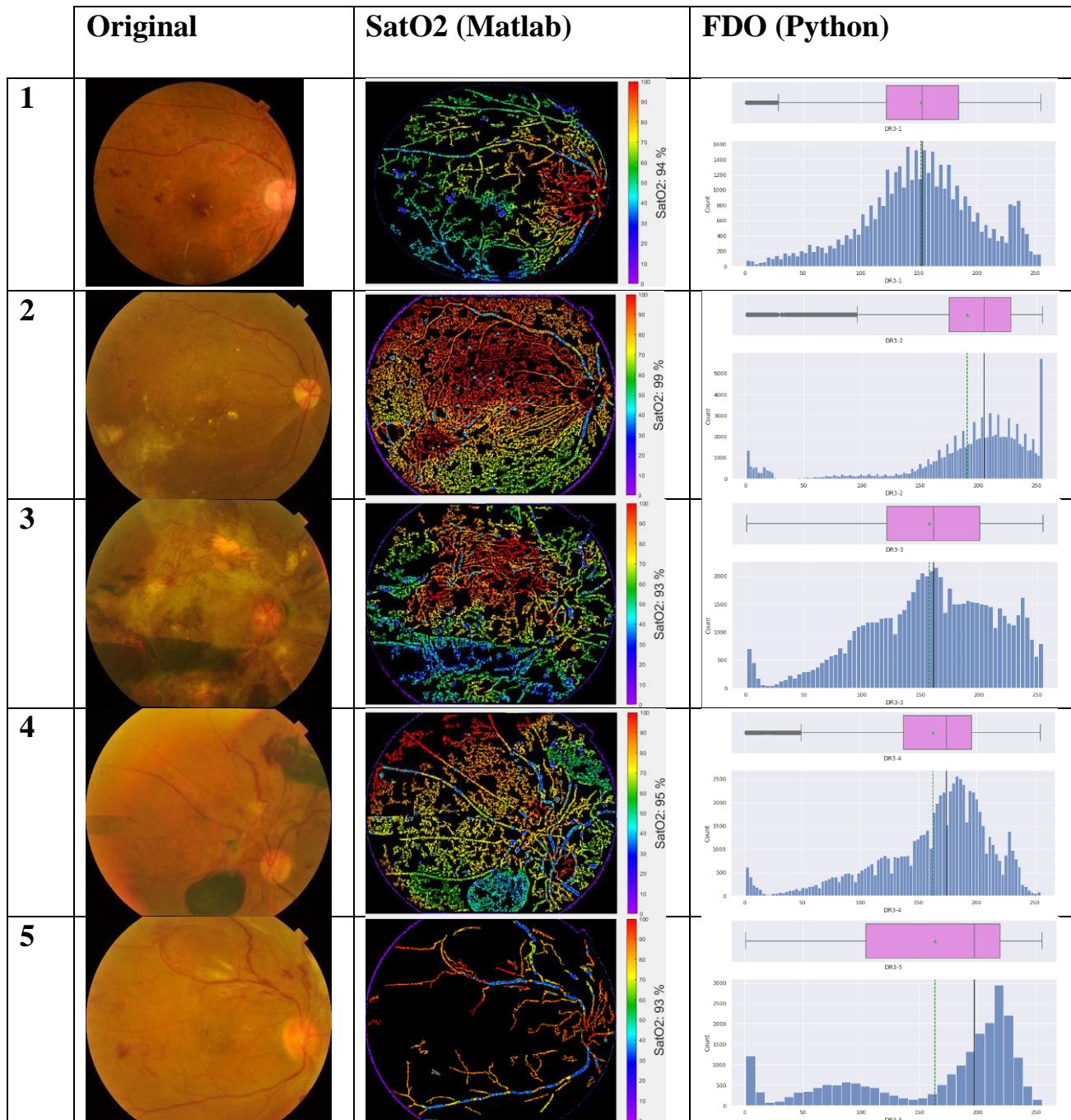
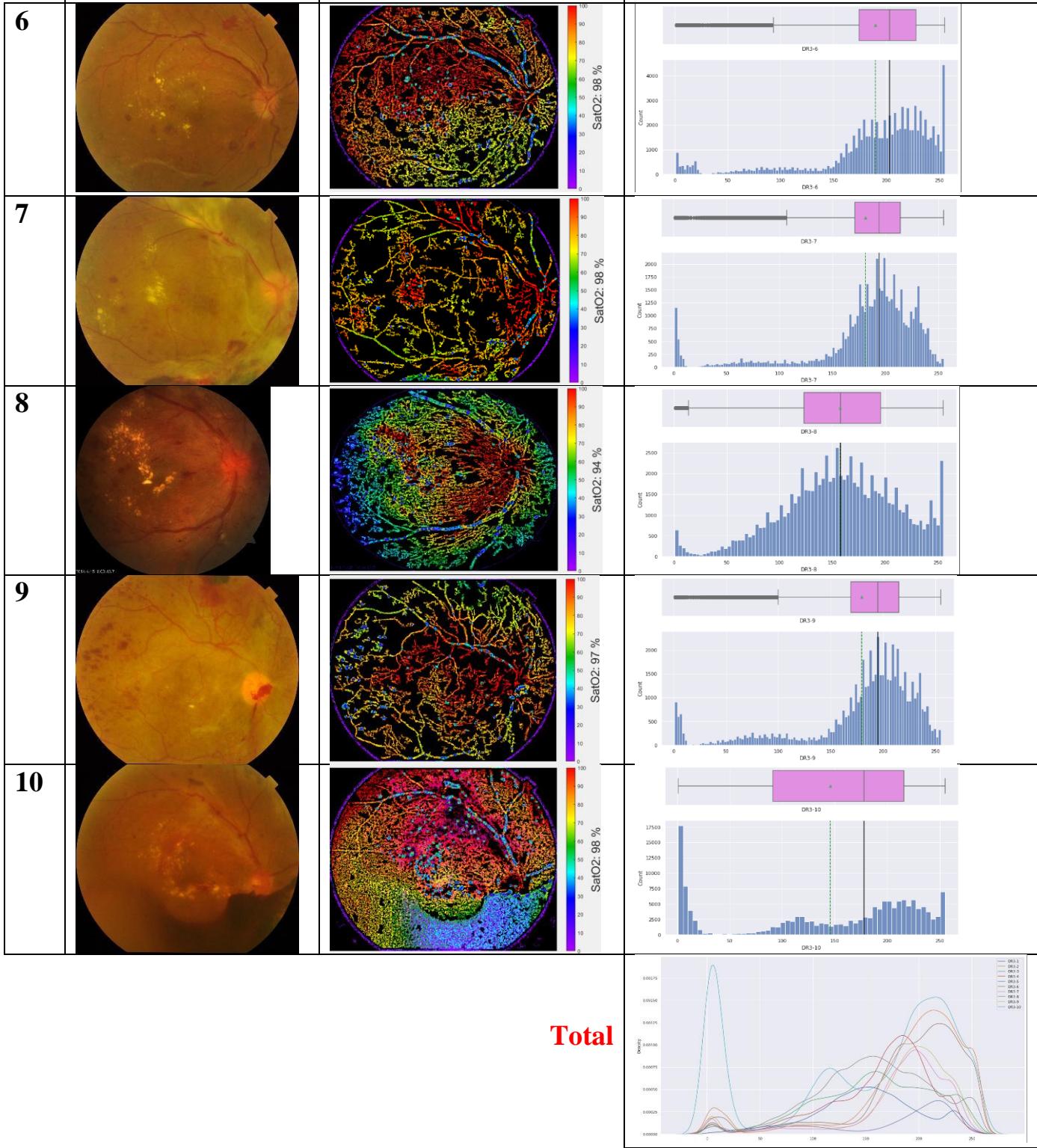
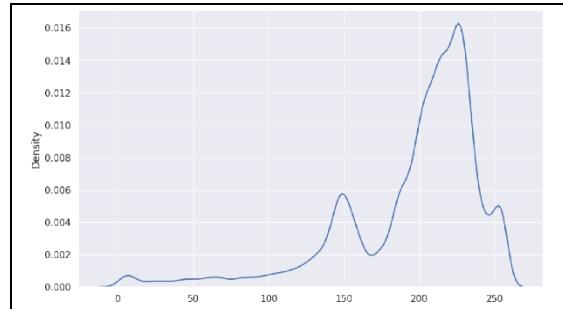


Table 6.1. Application of the pseudocolour method applied to patients DR3-1 to DR3-5 (Diabetic Retinopathy Type 3). In addition to the plot of the repetition of the values obtained from the vector of each image. It is observed that in this bias the patient data yielded a mean oxygen saturation of 94.8%.

Original Image	SatO2 (Matlab)	FDO (Python)
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Curva promedio de una ojo con  
retinopatía diabética grado 3



*Table 6.2. Application of the pseudocolour method applied to patients DR3-6 to DR3-10 (Diabetic Retinopathy Type 3). In addition to the plot of the repetition of the values obtained from the vector of each image. It is observed that in this bias the patients' data showed a mean oxygen saturation of 97%. Also shown is the distribution curve of values from the existing fundus images is 6.1 to 6.2 and the characterisation curve for this condition (Oximetric Distribution Function).*

## Results of Type 3 Diabetic Retinopathy with the Optic Nerve on the Centre ONC

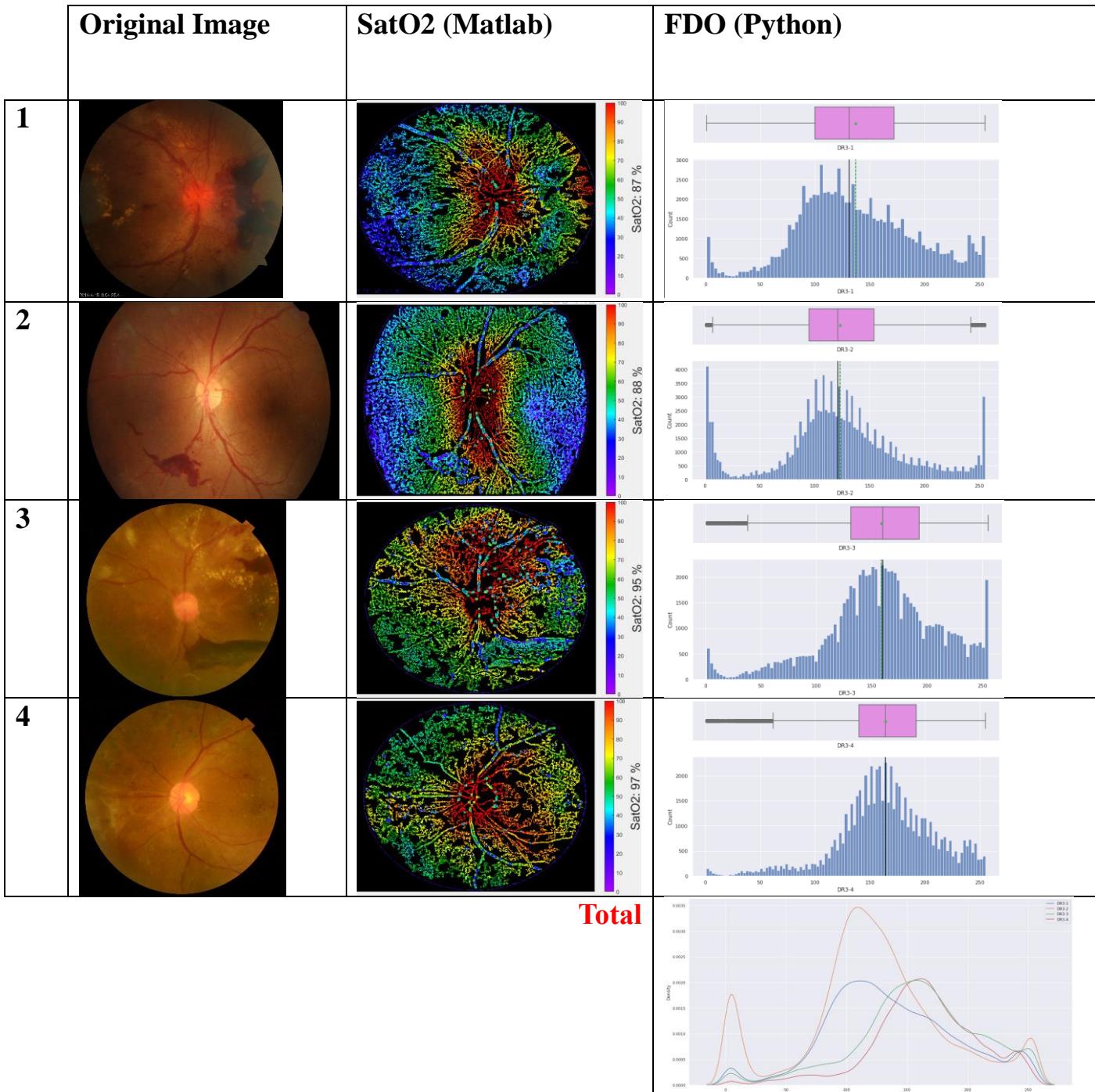


Table 6.3. Application of the pseudocolour method applied to patients DR3-1 to DR3-4 (Diabetic Retinopathy Type 3). In addition to the plot of the repetition of the values obtained from the vector of each image. It is observed that in this bias the patient data showed a mean oxygen saturation of 91.7%. Also shown is the distribution curve of values from the existing fundus images is 6.1 to 6.2 and the characterisation curve for this condition (Oximetric Distribution Function).

## Results of Type 3 Diabetic Retinopathy with the Optic Nerve on the Left Side ONL

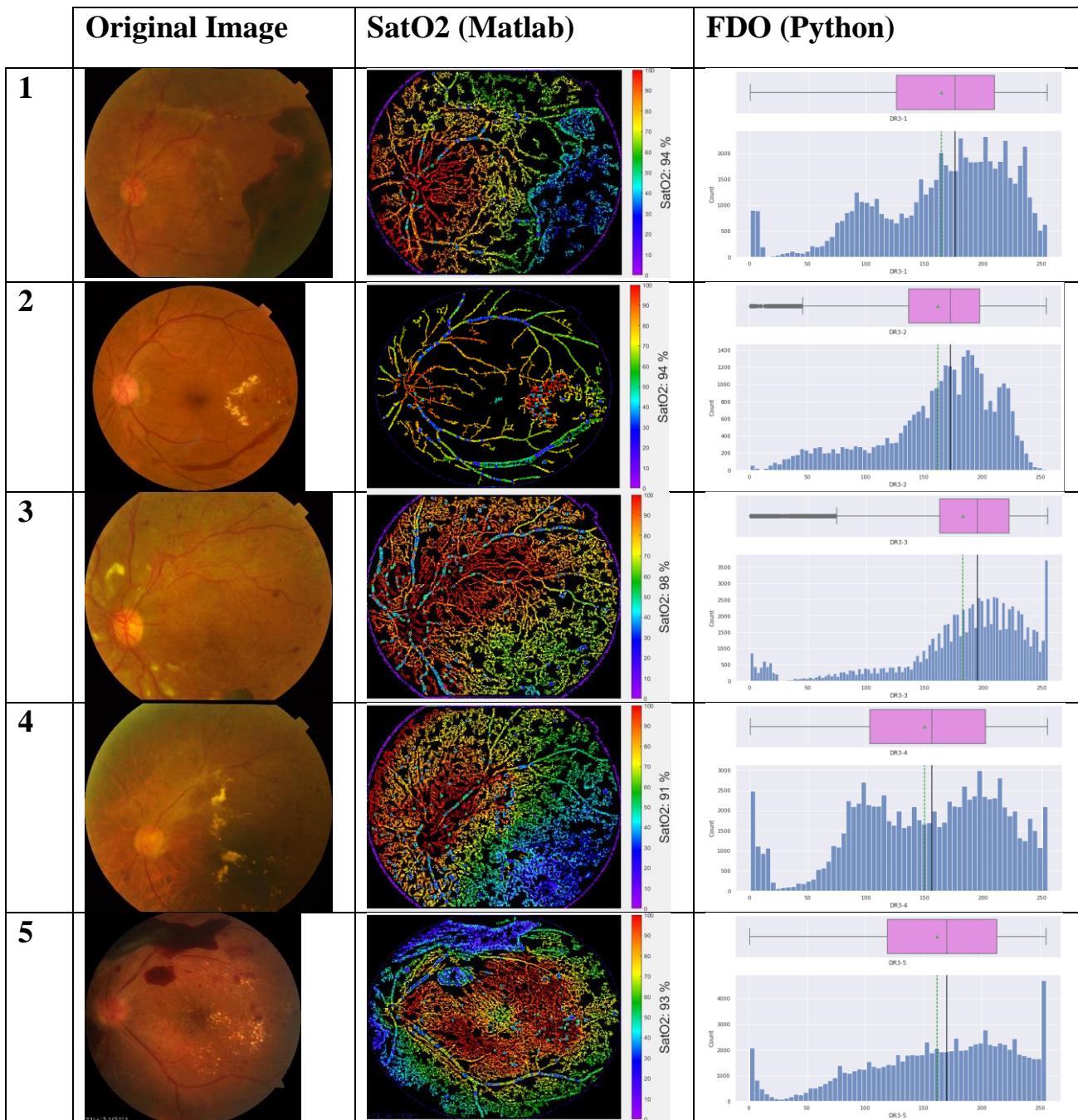
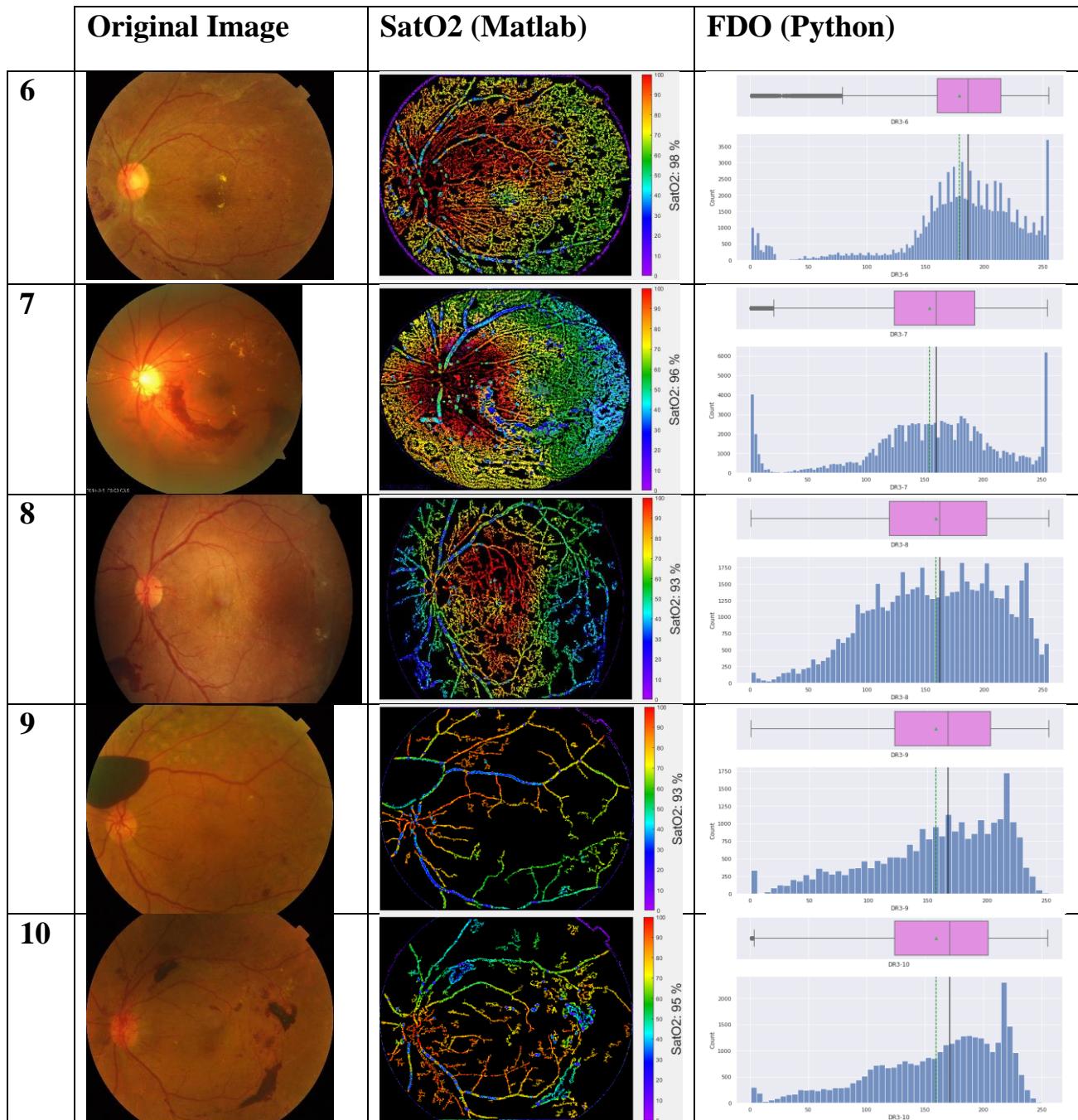
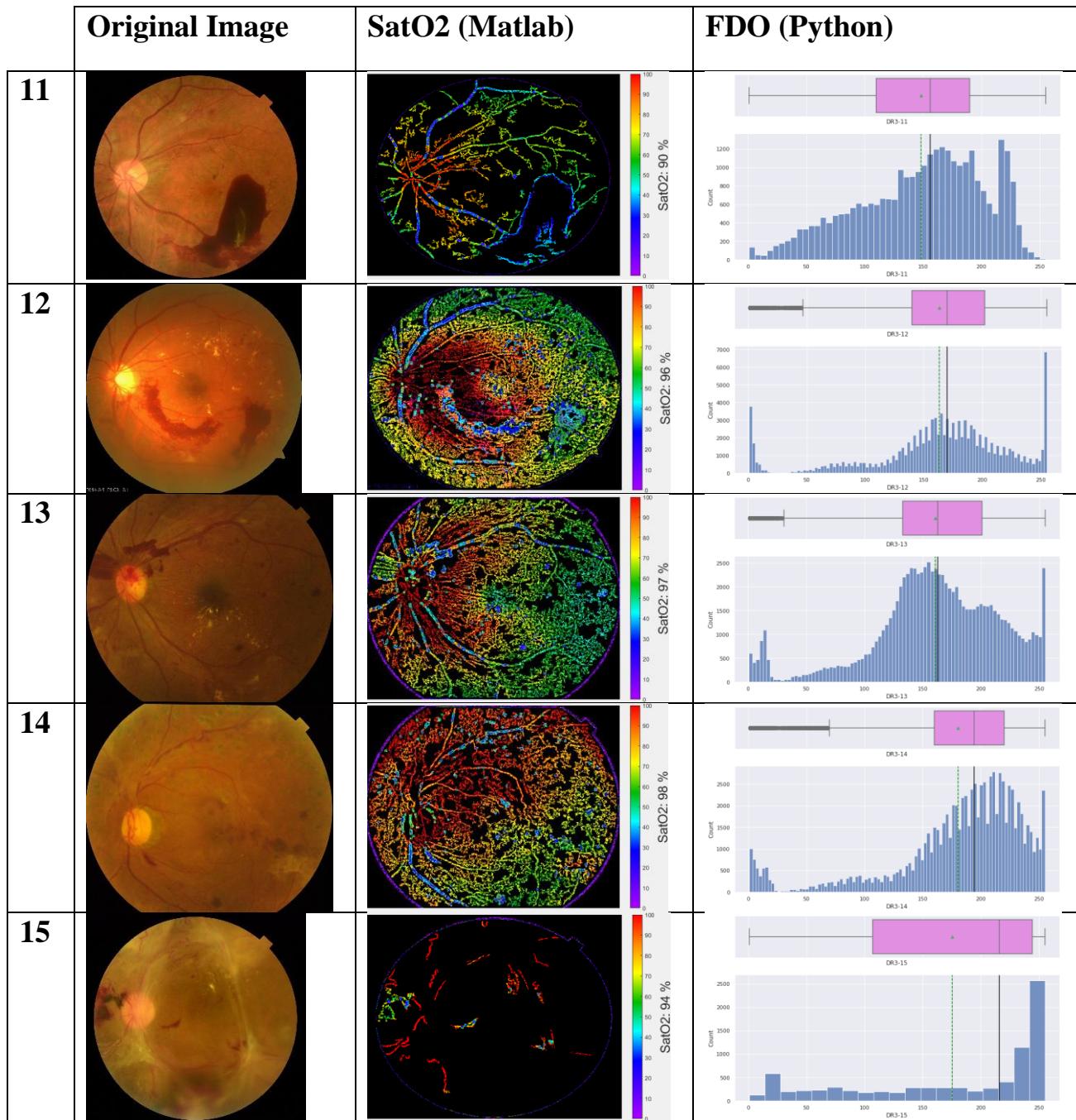


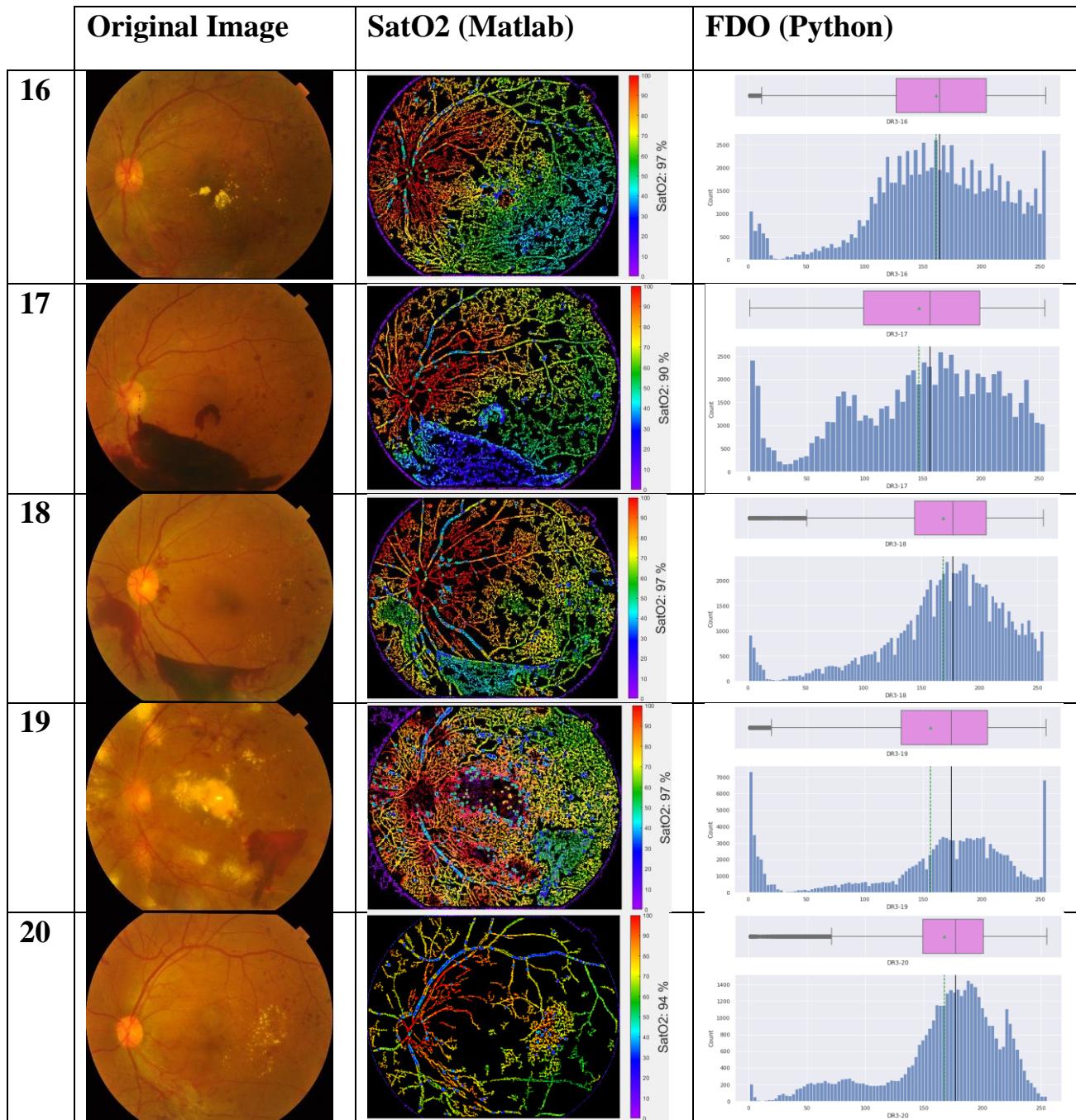
Table 6.4. Application of the pseudocolour method applied to patients DR3-1 to DR3-5 (Diabetic Retinopathy Type 3). In addition to the plot of the repetition of the values obtained from the vector of each image. It is observed that in this bias the patient data showed a mean oxygen saturation of 94%.



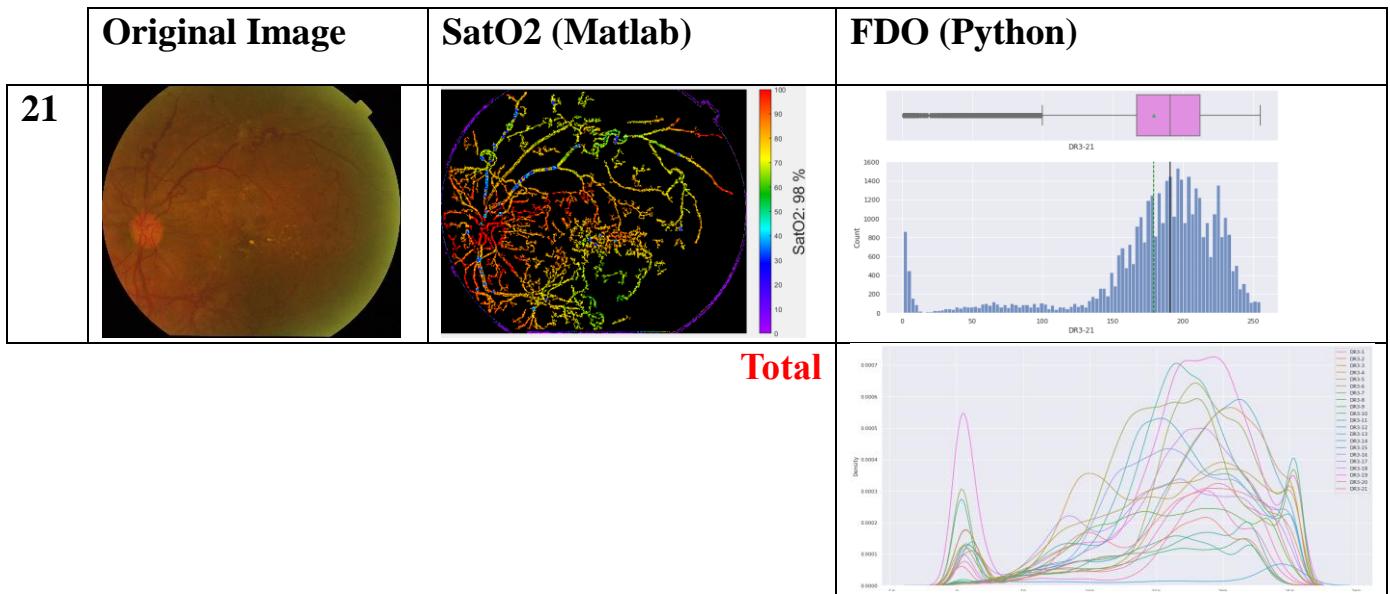
*Table 6.5. Application of the pseudocolour method applied to patients DR3-6 to DR3-10 (Diabetic Retinopathy Type 3). In addition to the plot of the repetition of the values obtained from the vector of each image. It is observed that in this bias the patient data yielded a mean oxygen saturation of 95%.*



*Table 6.6. Application of the pseudocolour method applied to patients DR3-11 to DR3-15 (Diabetic Retinopathy Type 3). In addition to the plot of the repetition of the values obtained from the vector of each image. It is observed that in this bias the patient data yielded a mean oxygen saturation of 95%.*

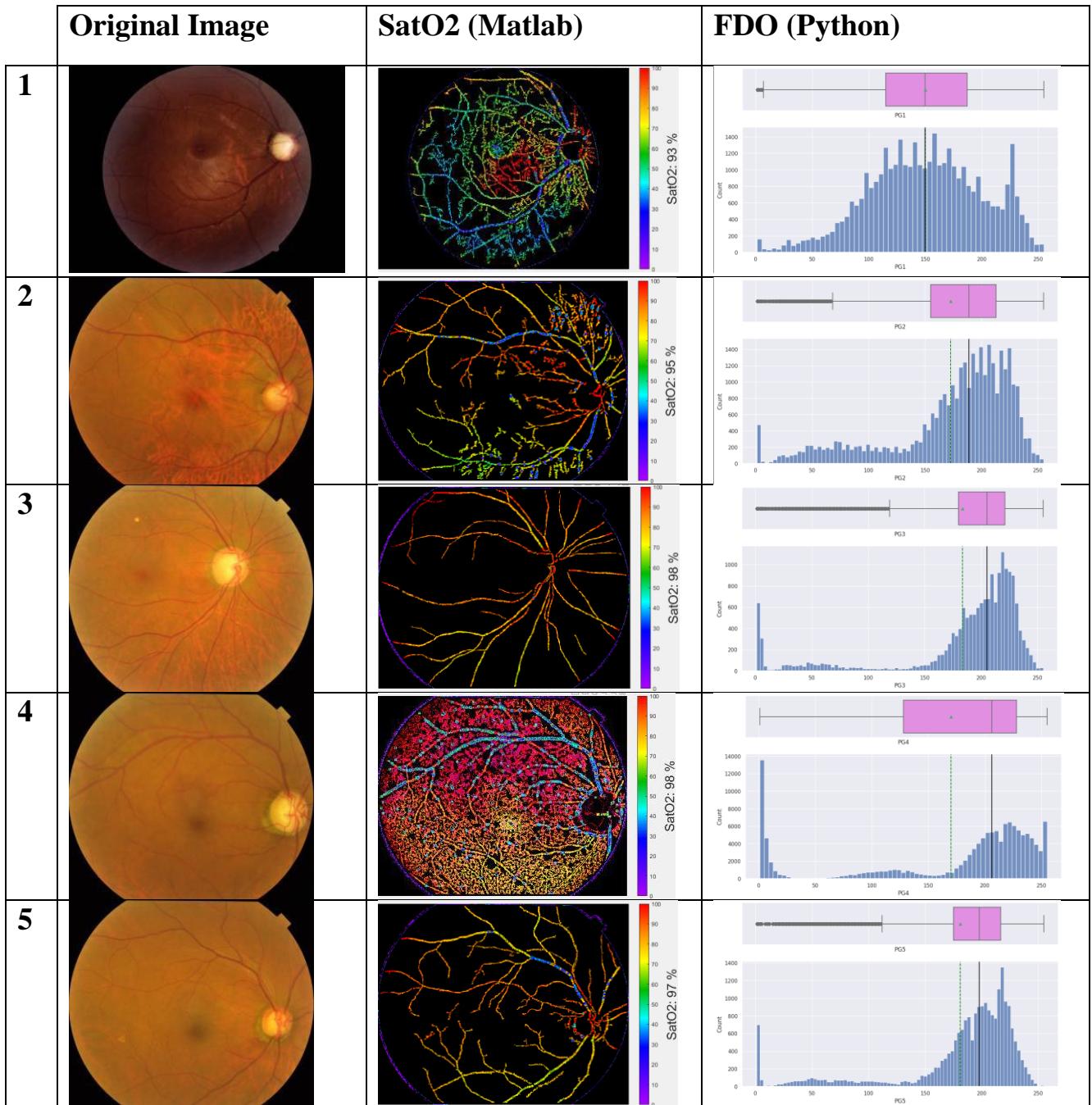


*Table 6.7. Application of the pseudocolour method applied to patients DR3-16 to DR3-20 (Diabetic Retinopathy Type 3). In addition to the plot of the repetition of the values obtained from the vector of each image. It is observed that in this bias the patient data yielded a mean oxygen saturation of 95%.*

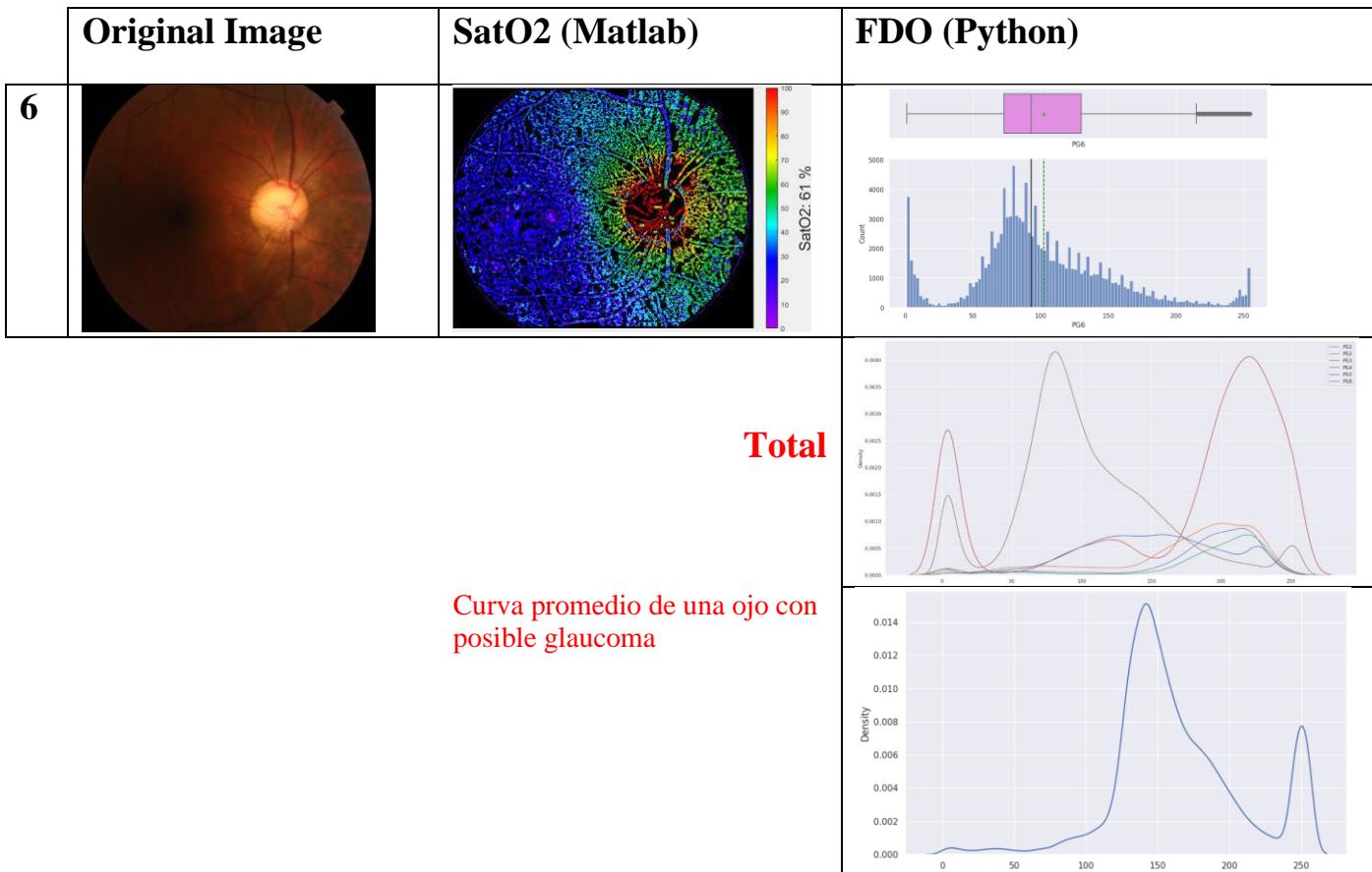


**Table 6.8.** Application of the pseudocolour method applied to DR3-21 (Diabetic Retinopathy Type 3). In addition to the plot of the repetition of the values obtained from the vector of each image. It can be seen that in this bias the patient data showed a mean oxygen saturation of 98%. Also shown is the distribution curve of values from the existing fundus images is 6.4 to 6.8 and the characterisation curve for this condition (Oximetric Distribution Function).

## Results of Possible Glaucoma with the Optic Nerve on the Right Side ONL



*Table 7.1. Application of the pseudocolour method applied to patients PG-1 to PG-5 (Possible Glaucoma). In addition to the plot of the repetition of the values obtained from the vector of each image. It can be seen that in this bias the patient data yielded a mean oxygen saturation of 96.2%.*



*Table 7.2. Application of the pseudocolour method applied to PG-6 (Possible Glaucoma). In addition to the plot of the repetition of the values obtained from the vector of each image. It can be seen that in this bias the patient data showed a mean oxygen saturation of 61%. Also shown is the distribution curve of values of the existing fundus images is 7.1 to 7.2 and the characterisation curve for this condition (oximetric distribution function).*

## Results of Possible Glaucoma with the Optic Nerve on the Centre ONC

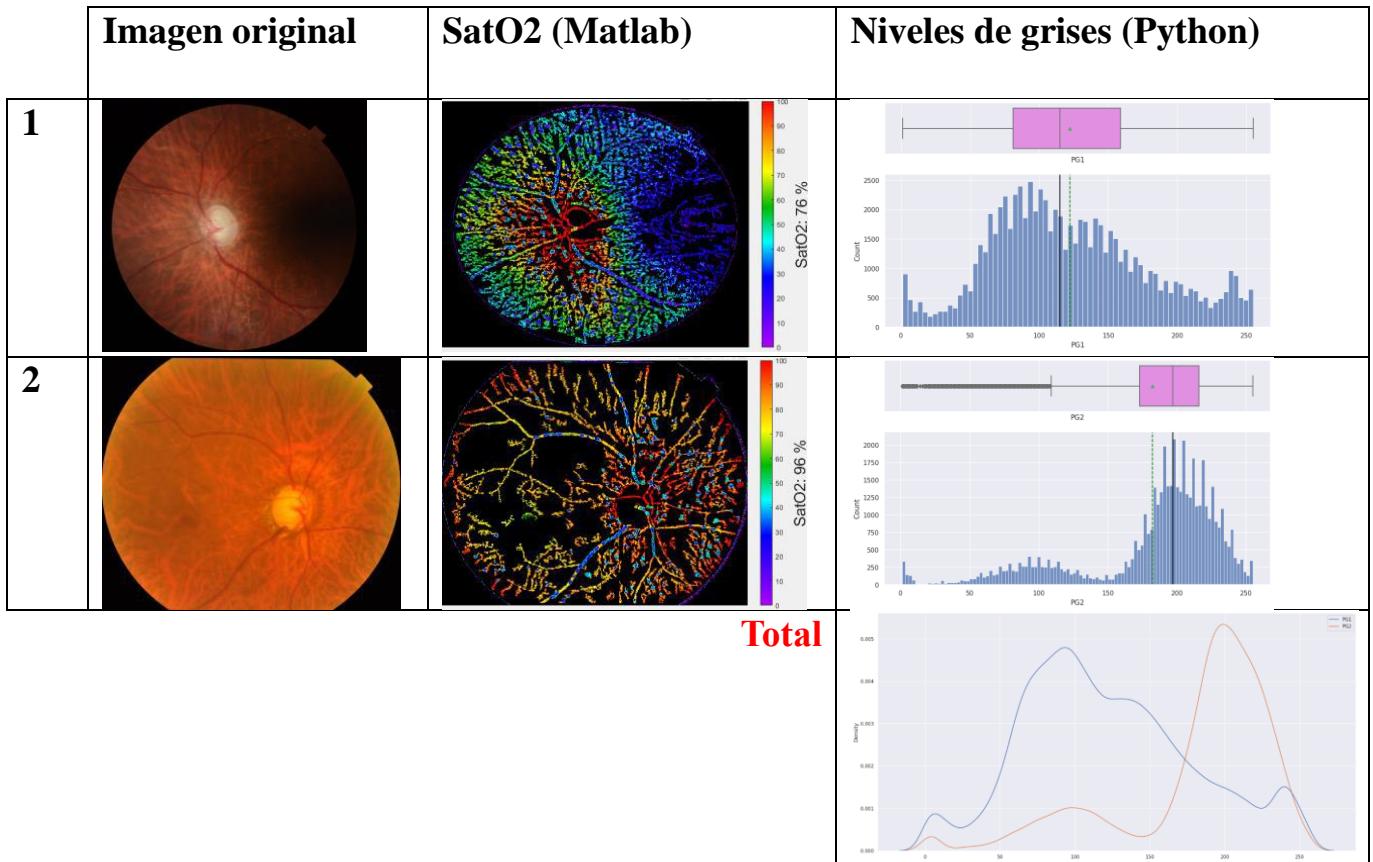
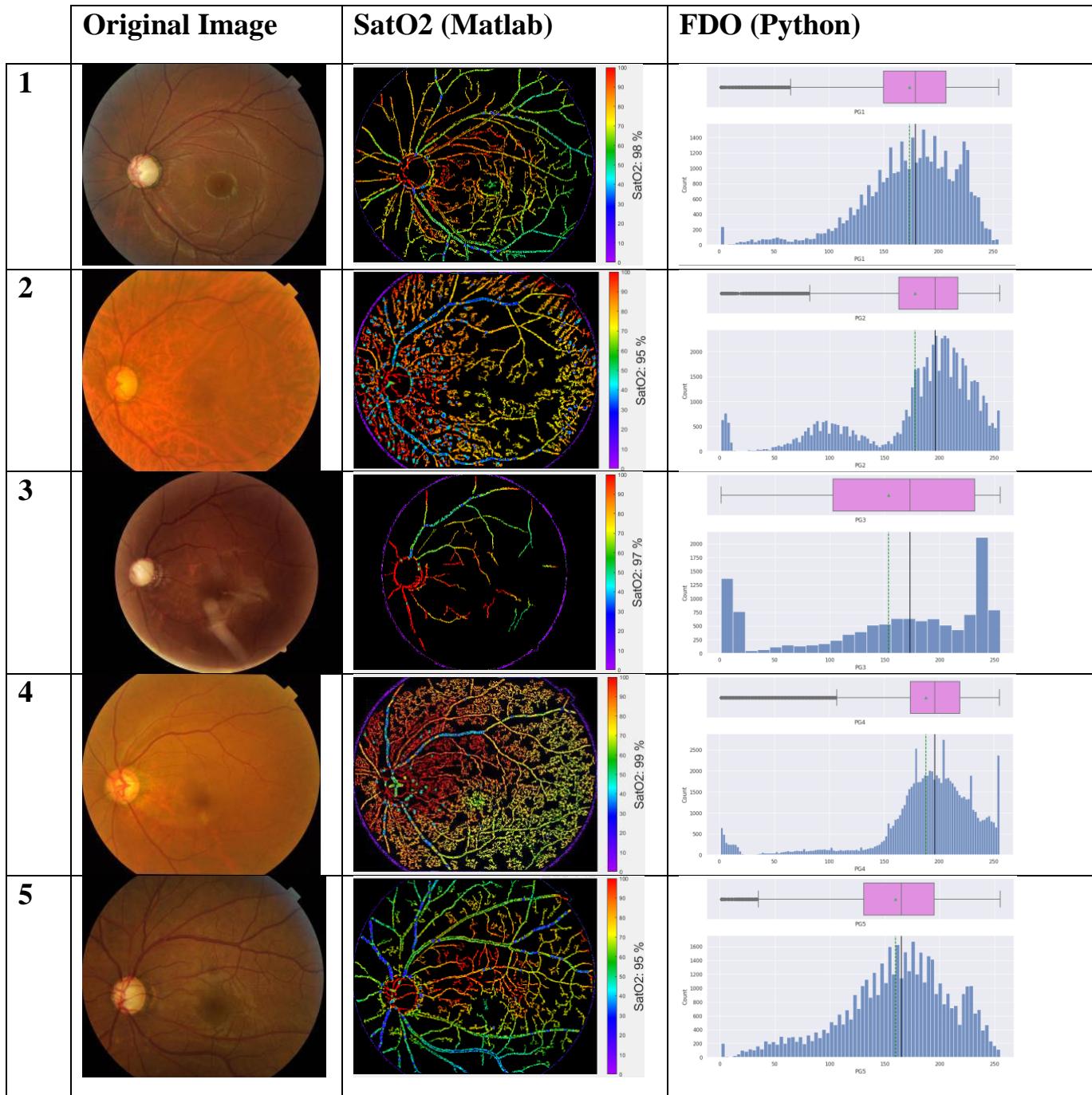
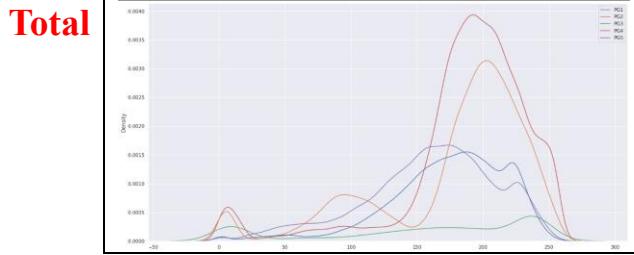


Table 7.3. Application of the pseudocolour method applied to PG-1 to PG-2 (Possible Glaucoma). In addition to the plot of the repetition of the values obtained from the vector of each image. It is observed that in this bias the patient data showed a mean oxygen saturation of 86%. Also shown is the distribution curve of values of the existing fundus images is 7.3 and the characterisation curve for this condition (oximetric distribution function).

# Results of Possible Glaucoma with the Optic Nerve on the Left Side ONL





*Table 7.4. Application of the pseudocolour method applied to PG-1 to PG-5 (Possible Glaucoma). In addition to the plot of the repetition of the values obtained from the vector of each image. It is observed that in this bias the patient data showed a mean oxygen saturation of 96.8%. Also shown is the distribution curve of values of the existing fundus images is 7.4 and the characterisation curve for this condition (oximetric distribution function).*